A CHILTON PUBLICATION

the Iron Age

NATIONAL METALWORKING WEEKLY

January 29, 1953

NTS PAGE 2

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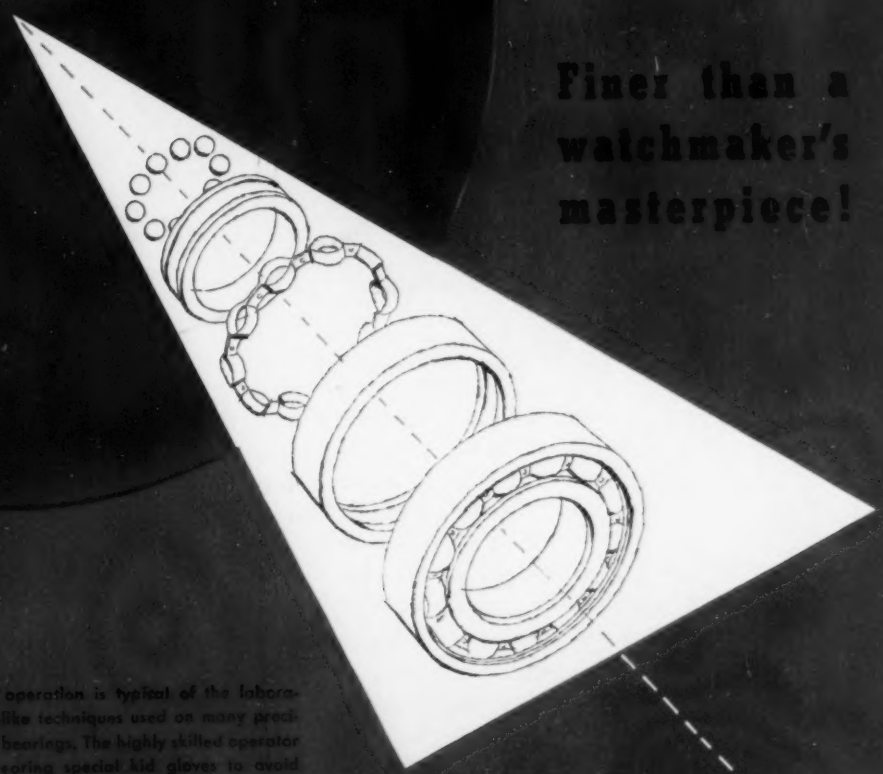
Finer than a watchmaker's masterpiece!

This operation is typical of the laboratory-like techniques used on many precision bearings. The highly skilled operator is wearing special kid gloves to avoid contaminating the ball bearing.



NOTHING ROLLS LIKE A BALL

est products of the watchmaker's art do not reach the high level sion attained by New Departure ball bearings. Manufacturing ts which insist on certain tolerances being held to millionths of give them the ability to provide virtually friction-free support. metal working industry, New Departure "Sealed-for-Life" ball s make possible better design of machine tools. N-D-Seals eliminate d of fixtures and lines for bearing lubrication . . . in many instances g less housing space and fewer parts.

h, engineering and production at New Departure are focused on jor objective, making the *best* ball bearings for every application.

NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT
Also Makers of the Famous New Departure Coaster Brake

How Hot can a Jet Get?

Whoooosshh! Jet engines generate a powerful amount of heat . . . heat which, uncontrolled in flight, would cause disastrous metallurgical distortions within the delicately balanced engine. So the problem is . . . or rather *was* . . . how to provide a dependably accurate means of measuring exhaust temperatures so that the pilot might have control over how hot his jets get.

And the answer? Special wiring harnesses running from engine to instrument panel . . . harnesses now made exclusively with Hoskins Chromel-Alumel thermocouple alloys.

Yes, wherever durability and accuracy are required in a thermocouple . . . whether for jet engines or industrial furnaces . . . you'll find Chromel-Alumel *right* for the job. Extremely durable . . . highly resistant to heat, corrosion, oxidation . . . guaranteed to register true temperature-E.M.F. values within specified close limits.

That's only part of Hoskins' product picture, though. Other specialized quality-controlled alloys developed and produced by Hoskins include: Alloy 785 for brazing belts; Alloy 717 for facing engine valves; special alloys for spark plug electrodes; Alloy 502 for heat resistant mechanical applications. And, of course, there's Hoskins CHROMEL . . . the *original* nickel-chromium resistance alloy used as heating elements and cold resistors in countless different products.

Heating elements made of Hoskins Chromel deliver full-rated power throughout their long and useful life.

Sparks fly better, last longer in today's spark plugs . . . thanks to Hoskins' spark plug electrode alloys.

Hot stuff for hot jobs! Hoskins Alloy 502 is ideally suited to many mechanical-structural applications.

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Mr. Wilson's Baptism

CHARLES E. WILSON loves to work: one might say he lives to work—if the work has a terrific challenge. To him there is only one way to do a job—the right way. His drive comes from the desire to get one tough one wrapped up and go on to the next. All other things seem to be secondary to him. That's why he reached the top.

To Mr. Wilson, money, stocks, former associates and General Motors' contracts had no connection with his desire to do a good job as Defense Secretary. To him that position meant hard work, red tape cutting, tested business procedure and use of experienced assistants. That's the way he operated at GM.

As president of GM he was surrounded with able assistants. He was sheltered; he had time to generate new ideas and the means to quickly give them substance. He delegated as good managers should. He was advised by his staff—and then made his decisions. If they had been far wrong he would have been looking for a new job.

Mr. Wilson's job took most of his time. He was insulated from "everyday" people. What he knew of them came from surveys on what they did or did not want in autos or refrigerators. Or his information came from his public relations men.

His job insulated him from congressmen. What he knew about them came from reports—written and oral. Occasionally he faced congressmen across the investigating table. His lawyers—as lawyers are supposed to do—advised him beforehand.

All this is as it should have been. His job was to run GM at a profit. His tools were ideas, lower costs, competition, product research and good management.

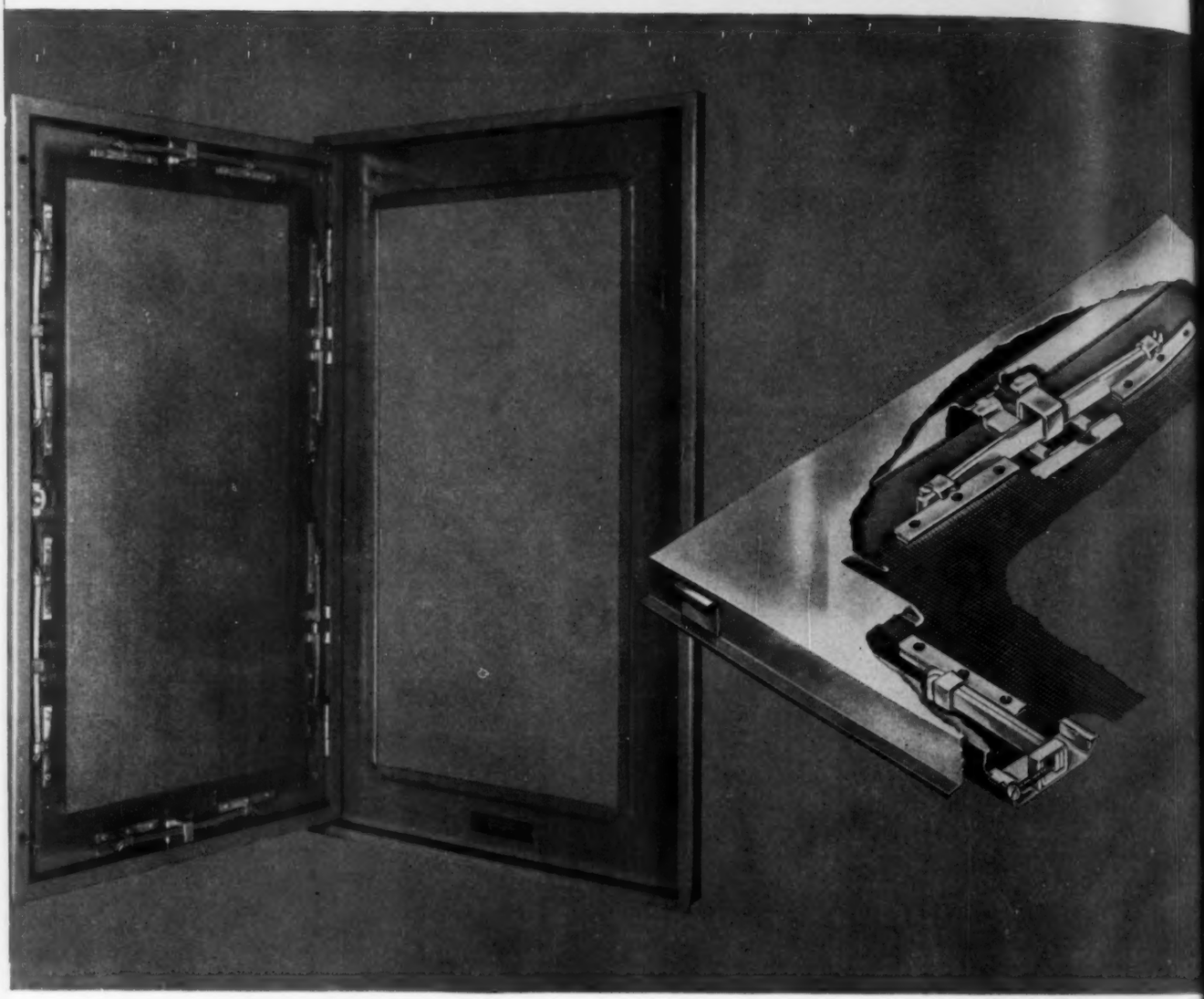
Then Mr. Wilson was baptized. He met a Senate Committee which asked him to bare his soul and his financial report. He met the "everyday" people via the press. It was painful but it came out all right. There was no question of Mr. Wilson's patriotism or integrity. What he went through could be beneficial to every businessman who would serve his country unselfishly. Read his humble statement to the senators:

"The thing that perhaps I overlooked myself was that not only did I have to operate honestly and fairly without prejudice, but all the people should also think that that was the way I was operating, and that part of it I did not quite appraise."

Tom Campbell

Editor

SHARON STEEL



Here's Window Construction that's Differ

Windows are primarily built to divert everything but the sun, air and view. There are concerns, however, who build windows primarily to prohibit escape. They are detention windows, and find their market in jails and prison hospitals. They require special construction to give them the strength to resist the attacks of both men and weather, and a special design that discourages tampering.

Special hard, rust-resistant steels, such as Sharon Galvanite*, are used in the frames. Tough stainless steel screening is firmly gripped by strong spring steel fingers. Here Sharon high carbon spring steels are used to accomplish that never-tiring hold that eliminates the possibility of screen removal. Moldings and exterior trim, subject to the ravages of weather, utilize the best weather-beater of them all—Sharon Stainless Steel.

If you're making windows, or product that requires quality s or if your needs are for stan hot or cold rolled steels, and want the finest, specify SHA all the way.

* T.M.

SHARONSTEEL

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SHARON STEEL CORPORATION *Sharon, Pennsylvania*

For information on Titanium contact Mallory-Sharon Titanium Corp., Niles, Ohio

Dear Editor:

Letters from readers

Good Job

Sir:

Congratulations on a fine job in preparing your annual issue of THE IRON AGE. Believe me we put this issue to good use.

C. S. LOUSKOS
Market Analyst

National Motor Bearing Co., Inc.
Redwood City, Calif.

Machinability

Sir:

Some 6 months ago I read an article in THE IRON AGE concerning development of a program by Ford Motor Co. It was in conjunction with the Navy Dept. with a purpose to do research on machinability of metals.

Any information you may be able to pass along on the subject would prove useful at this time.

C. C. COOK
Tool Engineer

Joy Mfg. Co.
Claremont, N. H.

The research program has been completed and has been put in book form, a summary of which was published in our Oct. 11, 1951 issue, p. 110. The book was prepared by Curtiss-Wright Corp., Wood-Ridge, N. J., for the U. S. Air Force.—Ed.

Powdered Metal Parts

Sir:

I understand that your magazine did a study of the possible markets and uses for powdered metal parts a short time ago. I would appreciate a copy of that study, if it is still available.

S. H. PENN
Sales Engineer

C. A. Robinson & Co.
Cleveland

Our research department has made a study on the powder metals parts used by the metalworking industry. A brief resume of this study appeared in our Jan. 1, p. 465, and Jan. 15, p. 49, issues.—Ed.

Cast Iron Wheels

Sir:

Your Dec. 18 Newsfront section contained the following item:

"Due to the switch from cast wheels to steel wheels on freight cars, one Midwest railroad will discontinue its captive foundry and become a mill buyer. Studies showed replacement costs, slower speeds made cast wheels a high cost item."

This implies that the railroads of this country have stopped using cast iron wheels in favor of steel wheels. As a representative of almost the entire cast iron wheel industry in this country I must take exception to this implication.

There has been some reduction in cast iron wheel shipments in the past 25 years but a study of our records shows that the average service life of these wheels has increased over 50 pct in this period due to metallurgical and design improvements combined with much more rigid specifications and inspection. Taking the effect of this on wheel requirements into account, the net reduction in shipments has actually been only about 20 pct. . .

There is a difference of opinion as to the desirability of using steel wheels. One of the largest railroads in the country is now using the latest design cast iron wheel on 70-ton cars on the basis of the improved performance of these wheels and on their calculations showing an economic advantage over steel wheels. . .

We are familiar with many of the conditions which resulted in closing the foundry mentioned. . . This railroad continues to use a large number of cast iron wheels purchased from wheel foundries adjacent to their lines.

C. M. STONER
Executive Vice-President

Assn. of Manufacturers of Chilled Car Wheels
Chicago

Cast Refractories

Sir:

Please send me six reprints of the article "Cast Refractories Replace Brick in Heating Furnaces" which appeared in your Dec. 18 issue, p. 140.

F. TRIMBLE
Plant Engineer

Wolverine Tube Div.
Calumet & Hecla, Inc.
Decatur, Ala.

Reversed

Sir:

Reference is made to your Jan. 1 issue, p. 439. Please refer to the drawing under title "Materials Used In Typical 1952 Four-Door Sedan." Kindly examine the rectangles "Steel 11 lb net" and "Aluminum 2556 lb." Are these figures reversed?

L. M. BARBEAU
Arch-Engineer
Estimating Branch

Corps of Engineers, U. S. Army
Tullahoma, Tenn.

The figures are reversed. They are correct in the accompanying table.—Ed.

Which kind of Cold Rolled Strip Steel is best for You ?

CONSIDER SHEET COIL

—if variations in physical characteristics are permissible.
—if fairly heavy oversize gauge variations are not objectionable.
—if the fabricating operations are not too complicated and do not require intricate expensive dies.
—if a fine surface finish is not essential.
—if a good base for paint or enamel is desired.
—if you do not object to some "square footage" loss due to oversize variation.
—then Sheet Coil will probably be the most economical material for the job.

CONSIDER THINSTEEL

—if you must have a high degree of uniformity of chemistry and physical properties—and precision gauge tolerances.
—if you wish to keep die wear low, no oversize gauge variations.
—if you require a fine finish or a better base for plating.
—if you want maximum yield for "most finished parts per ton."
—if you want selected tempers for maximum strength and lightest weight.
—then you'll find Thinsteel the most economical material by far.

You can always count on Kenilworth helping you get the right steel for your requirements. Order Sheet Coil or Thinsteel and notice that each coil carries an identifying tag as pictured above. Call on Kenilworth, too, for your needs in Stainless Sheets or flat rolled Spring Steels (Annealed or hardened and tempered).

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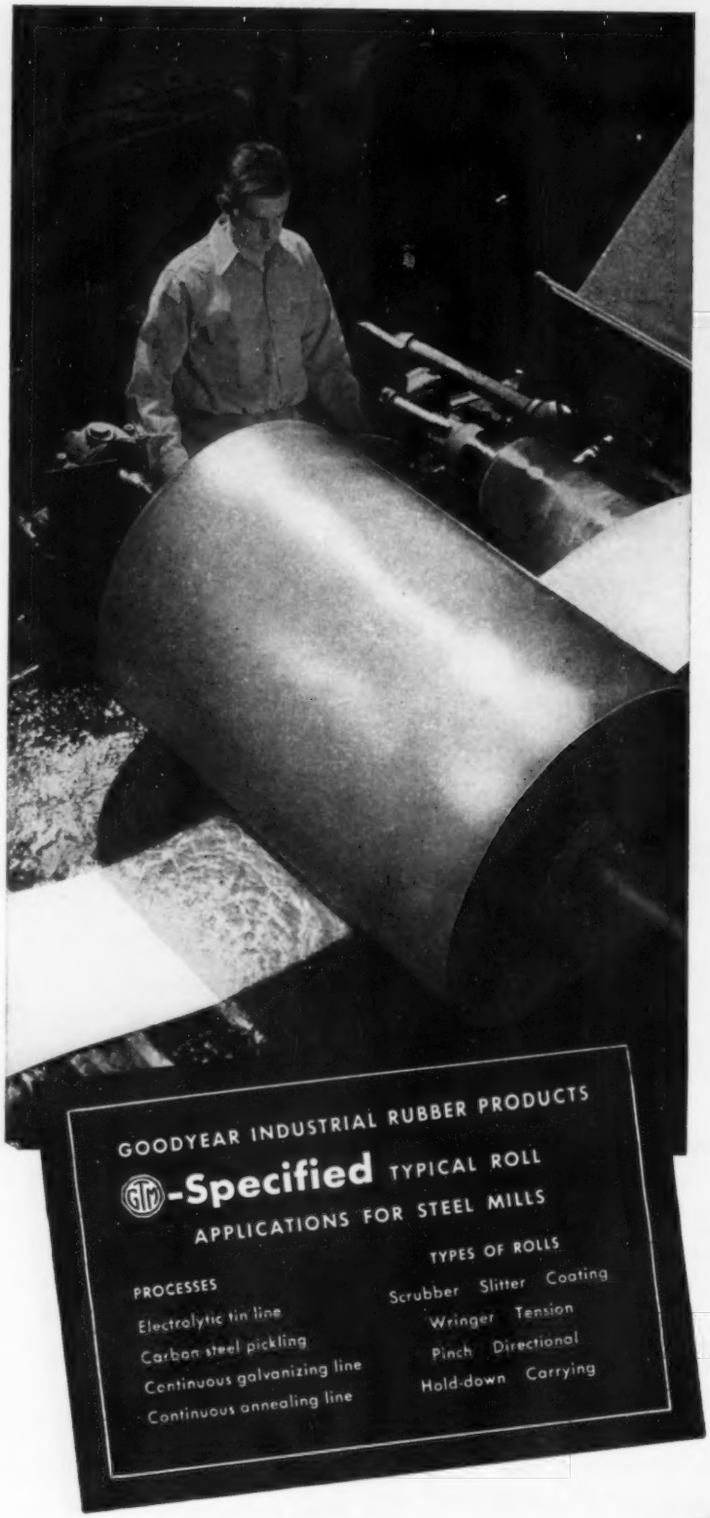

They rolled away their troubles on this strip pickling line

ON this continuous steel cleaning line—combining shot blast cleaning and pickling—stainless steel strip is passed along over and under rubber covered rolls specified by the G.T.M.—Goodyear Technical Man.

During processing, the steel strip undergoes shot blasting, as well as pickling in 16% sulphuric acid at 185°-190° and 12% nitric-hydrofluoric acid at 150°. The rubber hold-down and carrying rolls rotate in these acid solutions.

Special rubber compounds, specified by the G.T.M., are built into the roll covering to resist this heat and acid action. Result is longer life and more trouble-free service.

Goodyear's rubber rolls resist heat, chemicals, oil, abrasion, or other roll-killing conditions. Each covering is tailor-made to make the roll function as designed. "Superbonding" process permanently bonds rubber covering to the metal core.

Why not discuss *your* roll requirements with the G.T.M. now? You can reach him by writing Goodyear, Mechanical Goods Division, Akron 16, Ohio.

LOOK FOR YOUR GOODYEAR INDUSTRIAL RUBBER PRODUCTS DISTRIBUTOR *in the Yellow Pages of Your Telephone Directory under "Rubber Products" or "Rubber Goods." He handles Hose, Flat Belts, V-Belts, Packing, Tank Lining, Rubber-Covered Rolls built to the world's highest standard of quality.*

GOODYEAR

THE GREATEST NAME IN RUBBER

We think you'll like "THE GREATEST STORY EVER TOLD"—Every Sunday—ABC Network

Fatigue Cracks

by William M. Coffey

Lost and Found

We are constantly gaging the editorial value of your "favorite family journal" to see what improvements and changes are necessary to *keep* it your ffj. This is done by a continuous system of mail questionnairing of readers and by personal interviews of readers conducted by research specialists. (Incidentally, don't say you're not in if one should call on you. They are charming young women, picked not only for brains). To further judge if we're on the beam and hitting the ball as they say in Pogo Pogo, we also engage a Press Clipping Service which clips for us all mentions IA receives in newspapers and magazines—and herein lies a Fatigue Crack. We quote from a clipping just received:

DANISH BOG YIELDS
IRON AGE MAN'S BODY

A Danish bog has yielded the body of an IRON AGE man in an amazingly good state of preservation, Copenhagen reports. He is thought to have been slain 2,000 years ago as a human sacrifice to the goddess of fertility, Nerthus.
The man was of magnificent physique and his delicately outlined hands indicate he might have been a tribal leader, not used to manual labor. The facial features are still visible and the red hair is still firmly attached to the scalp.

Amazing, isn't it, how you finally run down these guys you send out to do a job? We haven't heard from this correspondent in years.

Stable Notes

A prominent New York society matron is being dropped from the blue book when it is discovered that she uses loaded dice, especially made for her, at her private crap games.

* * *

From the Jamestown, Va., *News-Gazette, October, 1608:*

Sunday was a lovely day. They found a dead pigeon in front of the public Meeting House that day. It seems this pigeon had a date with his girl friend at noon. She showed up on time, but he wasn't there. She waited. The minutes flew by. When he arrived 20 minutes late, she demanded, "What's the excuse this time?" "Darling," he replied, "it was such a lovely day I thought I'd walk."

Twenty rats can consume a ton of grain in a year. Contrary to common belief, racoons do not wash all the food they eat. Stick around. You'll learn things.

* * *

We forgot to tell you about one item of furniture we inherited from Charley (ex-Fatigue Cracks) Post. It's one of those signs that says THINK—that's all just THINK. It isn't enough we write this column?

Puzzlers

Here's the best answer we received to the check puzzle, from W. B. Lobbenberg, American Nickel Alloy Co., N. Y. C.:

The answer's 28 and 57 ($28.57)
But this here cheat won't land in heaven.
If again such a fortune should fall in his lap
We Should advise him to watch his step,
Because I think that our story teller
Will keep an eye on this here feller!

. . . and here's some more check puzzle winners: Bruce Relyea, George Weber, David Grant, Ann Curran, W. L. Braasch, B. E. Yarotsky and Mrs. L. M., who writes she's a secretary to a Sales Manager and when he's out of town she finds time to solve our puzzles. Uh, uh.

Now for the winners of the "nearby town" puzzle: George Weber, W. L. Braasch, Ann Curran, Victor Trybinski, Jr., E. L. Faneuf, H. L. Millar, C. S. Kennison, Benjamin Bertman, C. M. White, Jr., John Linskey, M. Tiktinsky, B. G. Bassett, John Statler, A. W. MacLaren, W. S. Gates, R. J. Steininger, T. B. Hudson, Jr., Charles Pipenhagen, D. M. Funk, John McMurray, Joe Voldrich, Robert Cederberg, D. S. Tarr, H. M. Roberts, F. Rondepierre, Seymour Samet, W. E. McCord and E. A. Schwab. The answer: The rate per hour is 34.28 mph, the length of the journey is 480 miles and he travelled 14 hours.

New Puzzle

Here's a nice puzzler from our ex-Machinery Editor, George Elwers, who says it can be done in 10 minutes: A theatre charges a dime for children, two bucks for women and five bucks for men. At a performance attended by some of each, 100 seats were filled and the box office take was $100. How many men, women and children were there?

Better Look Into This!

It was designed to fit your needs when building a new plant, or when modernizing or expanding your present one. Commercial Contracting Corporation developed the INDUSTRIAL PACKAGE PLAN integrating construction and machinery installation services under one contract and eliminating duplication of effort by assuming the entire responsibility as one contractor. Yes, better look into this plan for earlier production and lower costs.

AND THESE SERVICES:

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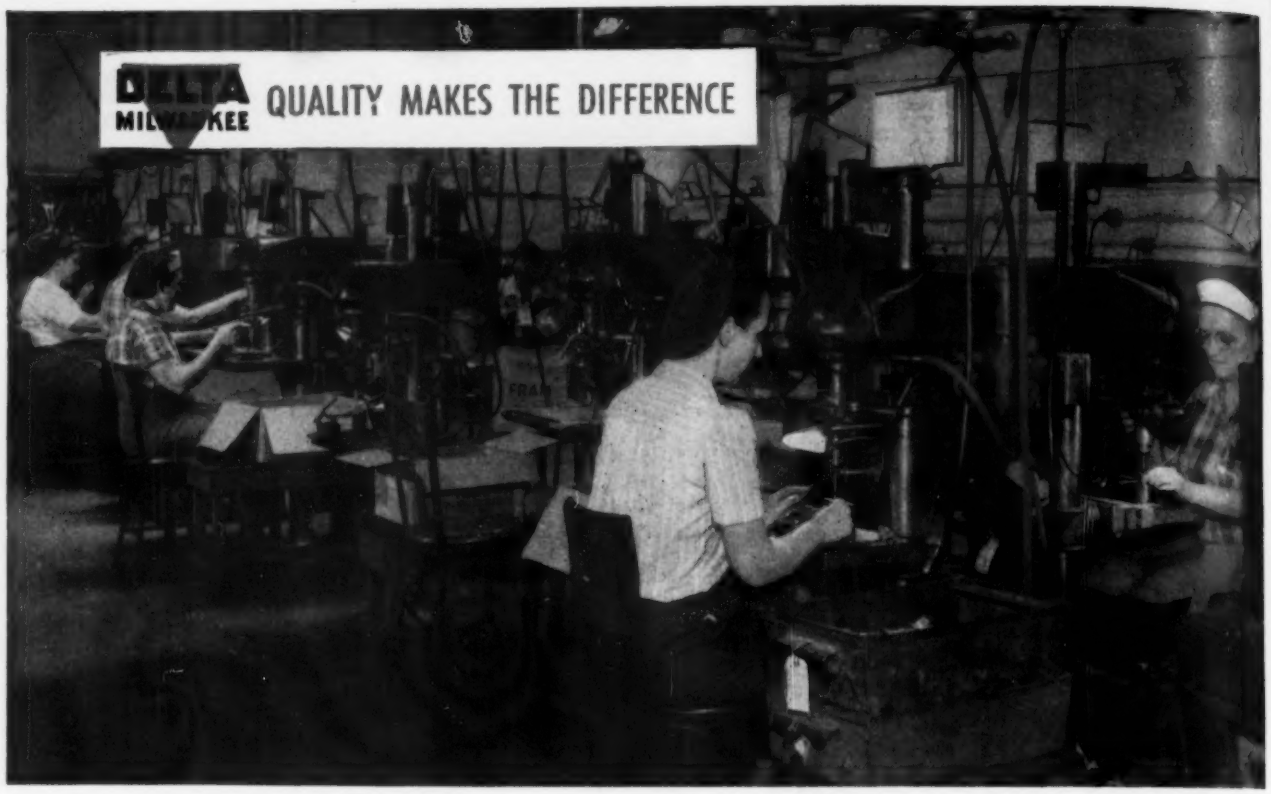

18 Delta drill presses work interchangeably on several materials. Additional machines, set up ready for use, can be moved in and out of the line. Simple fixtures and Delta accuracy make jobs practically fool proof on machines that almost "run themselves."

Down Go Costs

WHEN ASTATIC CORP. PUTS **DELTA TOOLS** ON JOB

These Production Ideas Will Work for You, Too!

Here's how the Astatic Corp., Conneaut, O., manufacturer of microphones, radio, phonograph and television parts, gets high production and high precision at low cost with a shop full of Delta tools—drill presses, grinders, metal cutting bandsaws, and abrasive finishing machines.

FLEXIBILITY—

Because Delta tools are light and mobile, Astatic takes them to the material, cutting handling costs; moves them, already set up, in and out of the production line as jobs change. Five different materials from steel to plastics are machined on the same Delta tools.

INTERCHANGEABILITY—

By standardizing on Delta, Astatic uses the same jigs and fixtures on several machines without adjusters.

FEWER SET-UPS—

By keeping machines set up for special jobs, one operator can tend several machines and do sequence operations. No waste motion. Because Delta tools are a low capital investment, they don't have to run constantly to pay out.

QUALITY—

Most of the Delta tools at Astatic have been on the job six to nine years with only routine maintenance—proving that Delta gives you machine tool quality at a cost any production operation in your plant will justify.

Do you have an up-to-date catalog of Delta tools? Call your Delta dealer. He's listed in your Classified Phone Book under "Tools", or write for Catalog AB, Delta Power Tool Division, Rockwell Manufacturing Company, 640 A N. Lexington Ave., Pittsburgh 8, Pa.

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

The Iron Age
FOUNDED 1855

THE IRON AGE Newsfront

A NEW LINE OF VERTICAL CHUCKING GRINDERS will soon be introduced by a large machine tool builder. Capacity will be from 30 to 74 in. Tolerances and finishes not obtainable by present turning methods will now be possible for larger sizes of work.

STANDARDIZATION ON ROLLER BEARINGS FOR FREIGHT CARS is expected this year by the Association of American Railroads. Except for final balloting, agreement seems definite. Of the more than 2 million plus freight cars running only a small fraction are now equipped with roller bearings.

NO NEW APPLICATIONS for certificates of necessity to expand iron ore production will be considered by the Defense Production Administration. DPA feels enough are now on hand to meet its goals. But the agency is welcoming new applications for expanding ore carrier capacity--lake, ocean-going, and inland waterway.

STEEL COMPANY EARNINGS, for fourth quarter 1952, will be the most favorable of the year. Second and third quarters were hurt by the 2-month strike. Fourth quarter will reflect efficient production from new facilities added during the year. Earnings will be better than they look because most new facilities will be depreciated during the next 5 years.

FAVORABLE PUBLIC REACTION to four sports cars with plastic bodies, shown by GM in New York last week, will speed field testing of plastic bodies. Such testing is now under way. But, any GM sports cars made will be of steel until tests are completed.

RADIO AND TV PARTS MAKERS are considering use of plastic dies for high production runs of stamped parts. Use of the plastic dies for small press work could be even more revolutionary than use of the dies in the auto industry.

A PATENTED BACKUP SYSTEM FOR POURING SHELL MOLDS is being well received. Molds made with special ribs and bosses are clamped together in a fixture for pouring. Pressure of one mold against another furnishes the backup.

DESPITE CURRENT EMPHASIS on the V-8 engine, don't expect the auto industry to scrap the "six-cylinder". The two largest producers, while both working on new V-8's, contend that advantages of the six in the low price field assure it a permanent position in the industry.

RETURN TO RECONVERSION could be the result of heavy shell production during the second quarter. Some steel men believe second quarter shell production will exceed first quarter schedules.

WAREHOUSES ARE BUILDING UP INVENTORIES again. Some are even able to build sufficient stocks to open new branches. Some supply puzzlers are cropping up. One midwestern unit reports a pileup of nickel stainless sheet. Reason: No customers with requisite NPA paper.

JOBBING OF SHELL MOLDS is still an experimental proposition. Chief difficulty is the high cost of the resin-sand mix. This, plus handling charges, is holding potential customers back.

SLASH DOWN-TIME FOR HOT REPAIRS WITH PERMANENTE 84!

DON'T let excessive down-time for hot repairs prevent you from getting maximum production from your open hearth or electric steel furnace.

Slash down-time to a minimum with patented Permanente 84 *periclase* ramming and patching mix—and increase your ingot production per year.

Because Permanente 84 is dependable and easy to use, *faster hot repair* is possible. And because it gives superior bottom performance, *fewer repairs* are required between heats. Here's why:

Permanente 84 is processed from high-purity sea water magnesia—gives an unbeatable combination of high refractoriness and chemical resistance. Its high density and chemical purity minimize penetration of slag and metals.

Get Permanente 84 *now* for open hearth and electric furnace rebuilds as well as for bottom, bank and tap hole maintenance.

YOUR Kaiser refractory engineer will give prompt attention to your refractory problem—will offer, where desired, research, design and installation service to give you maximum production most economically. Write for descriptive literature on Permanente 84 and the companion ramming mix, Permanente 165. Principal sales offices: *Chemical Division*, Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California. First National Tower, Akron 8, Ohio.

Kaiser Chemicals

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Basic Refractory Brick and Ramming Materials • Dolomite • Magnesia • Magnesite • Alumina • Periclase

STEEL: Perform Inventory Balancing Act

Iron Age survey shows inventories of manufacturers hold more steel but are unbalanced . . . Reserves higher than commonly believed . . . Inventory checklist by area—*Staff Report.*

Purchasing agents of manufacturing firms are deftly juggling steel stocks to fill inventory gaps widened by last year's strike. That considerable ground has been gained and a high level of production maintained in the past few months is evident from an IRON AGE survey of major steel consuming centers.

Steel users generally feel they can struggle through the first quarter. They show more worry about getting on mill books in the second.

Yet "imbalance of inventory" is becoming a swear-phrase among PA's who are able to amass respectable stocks of non-critical steel items but are harried in their search for others. Most voracious market is Detroit where automakers are pushing production and intend worrying about inventory later.

Reserves Hold Up—Despite the imbalance in steel stocks afflicting most (example: 10 days of alloy bars and 45 days in some carbon steel items), reserves are higher than is commonly believed. THE IRON AGE could find no evidence of production being seriously impaired for lack of steel—even considering the stress of rising production rates for many industries.

Items in shortage were those drawing heaviest defense attention, such as heavy plate and alloy bars, or those which were popular because industry was rushing to fill an invigorated civilian demand, such as sheets for autos. Pressure on mills for these products is unrelenting.

Warehouses Stronger — Warehouse stocks which stood at a wobbly 400,000 tons or 36 pct of normal inventory last Aug. 1 have rallied to an estimated 677,000 tons or 65 pct of normal. But sadly imbalanced inventory detracts from the value of such an increase. Warehousemen were greeting new customers, turned away partially by traditional mill suppliers.

In Chicago's large manufacturing center, purchasing agents were often over-ordering steel, sometimes accepting unneeded items merely to get sorely needed products. As in other areas where the business rate was flourishing, Chicago manufacturers wanted all the steel they could use to grab their share of an improved market—now.

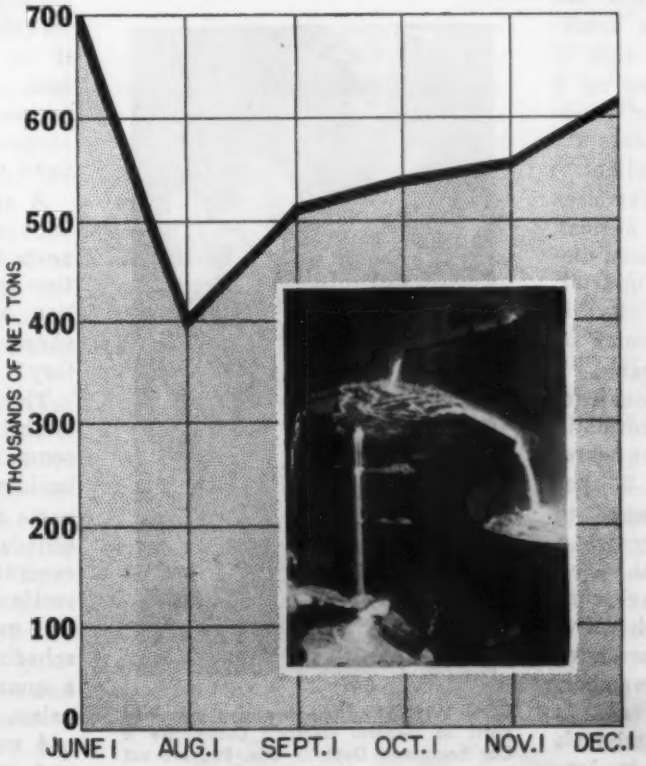
Needed Most—No. 1 on the procurement agenda of one tank, pipe, and automotive manufacturer were any kind of plate and hot-rolled sheets. General inventory was wavering a shade below 30 days and this firm intended remaining in conversion throughout the second quarter.

Several major users of steel admitted having 45-day inventories—up to the NPA limit.

A Chicago tank fabricator reported being able to get 55 to 60 pct of steel orders placed with mills. Pointing up the situation of forced over-ordering is the state of this plant's inventory. Normal inventory is a balanced 30 days—but today the firm suffers with a jumbled 45-day inventory that has too much of one item, too little of another.

Significantly, while the company views its reserves discontentedly its production rate

Trend of Warehouse Steel Inventory Tonnages



Source: American Warehouse Assn.

has climbed 30 pct. Much steel that would have ordinarily been used to balance inventory has been rushed to the assembly line.

Out of Balance—A Chicago appliance maker owns an overall inventory of 45 days—while stocks of a few small items ramble on to as high as 6 months. Normal inventory here is from 60 to 90 days. This traditional mill buyer has had to resort to heavy warehouse purchases and has been getting 50 pct or more from that source.

Mill shipments have been getting heavier and this is causing a proportionate decrease in warehouse purchasing. This firm reports mills were 2 months behind in shipments of hot-rolled sheets and 6 weeks on cold-rolled. To keep the home plant running, 50 pct of this company's steel is distributed to its subcontractors.

A Chicago furnace maker reports overall stocks of 45 days with 60 days considered normal. In the past 2 weeks warehouses have increased shipments by 10 to 15 pct to this plant.

Honor 80 Pct—A producer of construction equipment now has a 90-day inventory—in a breakdown of 30 days plus lead time in plant. Mill allocations are up 5 to 10 pct from December levels and up to 80 pct of its orders are being honored by mill suppliers.

Bar deliveries from warehouses have risen 15 pct over normal. Conversion steel use has been discontinued since the last quarter. Main procurement difficulty is plates and that's where much of the firm's worry is concentrated.

Another producer of construction equipment which normally bought 50 pct mill, 50 pct warehouse is now buying 90 pct warehouse and has managed to collect a 90-day inventory when 45 was considered normal. Ten pct of its steel came through conversion circuits but though deliveries continue no new orders have been placed since last November.

Holding Its Own—In Pittsburgh an appliance producer reports losing 1 month's inventory last year but has managed to hold its own. Its steel receipts in the fourth quarter were just under consumption. The conversion route is being used. Procurement focuses on heavy plates, special seamless tubing and pipe, heavy bars and wide flange structurals.

Another heavy industry producer in this district has carbon steel inventory ranging from 50 to 60 days. Tightest product is silicon steel of transformer grade —which makes up about 50 pct of its steel needs. This item has been at a rock-bottom low in inventory, sticking to a 10-day level ever since the strike.

Lean Sheets—A Cleveland firm producing for the auto industry said its hot and cold-rolled sheet inventories, which were at zero after the strike, had climbed to a still-lean range of from 10 days to 3 weeks.

Another plant in the same area reported a fairly well balanced inventory averaging about 30 days. Its worst imbalance is in heavy plates, still a nagging worry. It is also having some trouble placing second quarter orders for 16 gage sheets. But stocks of high chrome tool steel were reported in good shape.

COG WHEELS: These precision machined parts at General Electric's Locomotive & Car Equipment Dept. in Erie, Pa., are cut from discs of tough, high-grade steel.

Orderly Ordering—Still another Cleveland manufacturer estimated inventory of 90 days on the average; balance was termed "fairly good." Surprisingly, this firm reported fairly heavy reserves of silicon sheets and ½-in plates. Less surprising was the report of its purchasing agent that the scramble for steel had been replaced by more orderly buying.

Big average inventory did not necessarily reflect comfortable supply position. For example, one firm reported steel stocks averaging more than 90 days—at the same time it was having plenty of trouble locating large size tubing, structurals, and heavy plates. Carbon and alloy bars are in better shape as a result of substantial fourth quarter buying.

In Detroit manufacturers have generally made very little progress toward building inventories. This applies to automotive, parts suppliers, fabricators, stampers.

This does not mean that steel isn't rolling into Detroit. It is just that the production surge eats it up as rapidly as it's delivered. Non-automotive manufacturers are in nearly the same shape. Big production isn't confined to automobiles.

A spokesman for a body company supplying independents reports that the company's production is still a day to day proposition and it is unable to obtain sheets to meet schedules. Inventory? They have almost none.

The supply situation varies slightly among the automotive companies, but inventories are not building up. One independent reports steel "adequate for present schedules." This is definitely the exception. Auto companies are getting enough steel by resourceful methods to maintain good schedules, about 1.5 million cars a quarter, but this is a time of using, not building inventory.

A purchaser for one of the biggest auto plants says "we are still

playing checkers with every piece of steel."

Stampers are in fairly good shape. They have been able to build up some inventory. Those who have mill histories are able to add to mill deliveries with warehouse purchases to keep going without trouble. The main complication here is that those who would prefer to rely entirely on mill sources don't like to have to pay warehouse prices. They are not in trouble, however.

Detroit area fabricators claim good deliveries on structurals and a marked easing in this category in the past 30 days. Outstanding orders are beginning to flow. Some fabricators report they are up to pre-strike levels. The biggest fabricator here, however, says mill deliveries are behind and no reserve has accumulated.

Losing Ground—Here is what post strike production has meant to an automotive spring and wire manufacturer. Chiefly through outside help, it ended up the steel strike with a respectable inventory. Now, months later, the inventory is 50 pct lower than it was at the end of the strike. Consumption is just that much ahead of deliveries.

Chrome stainless strip, not even under controls, is tight here and manufacturers of automotive bright work are also using the "hand-to-mouth" expression.

Bright work makers have not had to stop production because of stainless problems, but many are afraid to book too many advance orders for fear of not completing them. Caution is the word.

There were sure signs that many firms whose orders had been partially snubbed by steel mills made more thorough use of warehouse sources. But warehousemen in many districts were worrying that some "flash-in-the-pan" buyers would later revert to traditional mill sources. Yet generally warehouses expected solid business for the first half of 1953 and hoped that a rising business rate would take them along for the ride.

NICKEL: Boost U. S. Production

DMPA-Hanna pact triggers mining of only U. S. deposit . . . Oregon orebody output to hit 6000-8000 tons yearly . . . DMPA will pay $6 per ton, wants 62,500 tons.

Only known major nickel deposit in the U. S. will be mined as a result of newly signed contracts between the government and Hanna Coal & Ore Corp. and Hanna Nickel Smelting Co. Working the orebody, near the top of Nickel Mountain, in southwest Oregon, will increase supplies of the critical alloying metal by 47,500 to 62,500 tons over an 8-year period.

The two firms, both subsidiaries of M. A. Hanna Co., will build crushing, drying and smelting facilities as well as dig the lode.

Hanna Coal & Ore will foot the estimated $4.3 million cost of developing the mine. Defense Materials Procurement Agency must be supplied at least enough ore to produce 47,500 tons of contained nickel at a price of $6 per dry ton of ore containing 1.5 pct nickel. The agency wants 62,500 tons.

New Plant — Smelting will be done by the other firm in facilities it will build. Ferronickel will be produced for a maximum of 79.39¢ per lb for the first 2500 tons of nickel and 60.5¢ per lb thereafter, exclusive of amortization.

A $24.8 million loan will be advanced by DMPA to the smelting company. Of this, $22 million will be used for construction of the facilities and will then constitute a mortgage on the plant. This will be written off during the term of cilities and will then constitute a the contract — both agreements run to June 30, 1962—if the firm holds up its end of the bargain by producing at least 47,500 tons of contained nickel.

Fast tax write-off certificates have been granted to both companies by Defense Production Administration.

First Use — Engineering tests, according to DMPA Boss, Jess Larson, have proved that ferronickel—never before used on a commercial scale—can be substituted for pure nickel in the production of stainless steel and various other low-alloy steels. Thus far it has not proved practical to substitute ferronickel for pure nickel in making high-alloy steels.

Average nickel content of the ore is 1.5 pct as established by core drilling tests. Because of its nature, working the lode would not be commercially feasible at present, said Mr. Larson. And unless some technological improvements are made during the period of the government contract, there is a good possibility that these facilities may have little use once the agreement expires.

Mining operations are tentatively scheduled to start in the summer of 1954 and actual smelter production by October of the same year.

Scalp The Mountain—Open pit methods will be used, almost literally taking the top off the mountain. Ore will be crushed at the mine site and transported down the side of the mountain by a 2-mile conveyer belt to a stockpile at the smelter's location. It will then be crushed and dried twice before smelting. Copper will be one of the byproducts of the operation.

MEDICINE: How Much Does It Cost?

Industrial Health Congress gets figures on costs, savings of in-plant programs . . . Cheaper for larger firms . . . Cancer, radiation hazards cited . . . G.P.'s needed—*By K. W. Bennett.*

Industrial health and safety programs are often intangible. Their results—and costs—are difficult to measure in dollars and cents. But 400 doctors and industrial health officials, meeting at Chicago last week, came up with some hard cash cost figures.

They Found Out—With speakers representing labor, management, and medicine participating, here is what members of the 13th Annual Congress on Industrial Health learned about costs.

For the large industrial firm, health and safety programs cost $19 per worker per year. For the small or medium firm, cost soars abruptly to $40 to $45 per year.

How Much?—A recent National Assn. of Manufacturers survey of 3600 companies shows that 1100 companies reported reductions in compensation premiums averaging 30.3 pct. Reduction in accident rate was reported by 700 companies amounting to 43.5 pct. Figuring a national average accident cost of $40 per employee, the saving is substantial.

Lower absenteeism was reported by 800 companies at 25.6 pct. Labor turnover reductions of 29 pct were reported by 640 companies. With training costs what they are, the saving is again substantial. In occupational disease, 680 companies reported a 45.6 pct drop.

New Dangers — Besides going over the balance sheet on health and accident programs, the congress reported that there is: (1) increasing incidence of lung cancer in industry; and (2) growing exposure to radiation in industry.

Growing use of the betatron, radioactive cobalt, other radioactive compounds, and X-ray for metal inspection requires special safeguards to workers' health.

GRATIS: Jones & Laughlin Steel Corp. passed out 'flu shots on the house in Pittsburgh last week as the U. S. worried over a possible epidemic.

What's Needed — Some of the precautions: Radioactive dust particles must not only be kept out of workers' lungs, but must not be allowed to work into cracks in walls or worktables. Shielded storage cabinets for radioactive materials are not only necessary but should be checked for adequacy.

A case in point was the use of an old lead-shielded Xray room as housing for a new cobalt-60 testing unit. Lead shielding had been adequate for the Xray, but allowed radiation from the new unit to reach the floor above.

Cancer Causes—New accepted weekly tolerance dose for workers exposed to alpha, beta, gamma, or Xrays is 0.3 roentgens. This is a drop from the old standard of 0.6 roentgens per week.

On a different bent, it was speculated that dust, mists, gases, and fumes entering the lungs might account for the rise in cancer. A few chemicals are suspected of being cancer-producing, but much research is needed to prove it.

G. P.'s Wanted—A major problem attacked by the congress was bringing the medical line trooper, the general practitioner, into the industrial field. He may feel that industrial work will interfere with his private practice. He may feel that industrial medicine offers too narrow a field for full use of his training. He may feel that industry may be unable to offer him security—may cut its medical program when business gets slow.

Two suggestions seemed particularly attractive. The first: Post-graduate "seminars," 2-day to 2-week meetings at which general practitioners would hear industrial medical men talk over new techniques and possible types of industrial health programs.

These are not new, but more extensive use would be valuable, specialists believe.

One for Six—Second plan is not new either. But it has proven successful in at least one case. Six competitive companies in a single town hired a doctor, set up a dispensary at each plant, installed a full-time nurse at each dispensary.

Plants range in size from 400 to 3500 employees. The doctor allocates his time at each plant by number of employees. Besides a minimum injury rate in the last 2 years, the program has been purchased at the extremely low rate of $8 per employee. (Contrast $19 for the large firm with an in-plant service.)

A check of M.D.'s entering industrial practice indicates at present there are more plants looking for doctors than there are doctors looking for plants. Besides post-graduate programs, the congress hopes to increase recruiting of the needed medicos among internes who have not yet gone into private practice.

AUTOS: Will Escalator Break Down?

Revision of Consumers' Price Index threatens Detroit labor peace . . . UAW asks renegotiation of wages, pensions . . . Says present clauses outmoded by inflation—By *R. D. Raddant.*

Will the olive branch that has kept labor peace throughout the auto industry be withdrawn with the Feb. 15 revision of the Bureau of Labor Statistics' Consumers' Price Index?

It is well known that the escalator clauses of contracts between United Automobile Workers and the auto companies are tied inexorably with the BLS price index. Because this index is to be replaced, UAW wants to renegotiate for higher wages and pensions.

Strike Threat?—Walter P. Reuther, new CIO president as well as UAW president, has declared that "abnormal inflation" has outmoded present wage and other economic provisions in union contracts.

"Obviously, in the absence of an agreement by Mar. 1 (the date for the next wage adjustment), there is no contract," Mr. Reuther declared. Implication is that if the companies do not come to terms, a wave of strikes will follow.

Discussion of the question should be separated into two divisions. First is whether UAW has a valid contention that the index opens the entire contract to renegotiation. Second concerns the merit of union demands.

What's Wrong—Root of the issue lies in paragraph 101, section k, of the contract between UAW and GM, the basic contract of the industry. Signed in 1950, it has until June, 1955 before expiration. It states:

"The parties to this agreement agree that the continuance of the cost-of-living allowance is dependent upon the availability of the official monthly BLS Consumers' Price Index in its present form and calculated on the same basis as the index for April, 1950 unless otherwise agreed upon by the parties."

Possibility of a loophole was pointed out early in 1952 (THE IRON AGE, June 5, 1952, p. 110) when the Labor Dept. first indicated it intended to scrap the old index. New index is based on 1947-49 prices, includes many new items like beer and TV sets.

Compromise Possible—It is clear that the parties to the agreement must sit down and agree on the applications of a new index. It is not clear that the entire contract is open to discussion. UAW contends it is. There has been no word, on or off the record, from industry on this point.

But it is clear that industry considers the contracts exactly what they were intended to be—5-year pacts. This does not mean that the door is automatically closed to any revision. Harlow H. Curtice, acting president of GM, has said that GM is in constant private discussions with UAW. Other companies follow the same procedure.

But there appears to be no indication that GM or any other company intends to see the contract broken because of the index technicality. One source, not too realistically has said the industry would immediately slap a monumental breach of contract suit on UAW in case of any strike. Few believe things will go that far.

But some point to the terrifically high production schedules of the industry as an indication that the goal is to get as many cars built as possible before any strike looms.

What They Want—Getting back to union demands, major points of UAW requests are:

First, and most likely to receive attention, is an adjustment in basic wage rates so that 20¢ of the 25¢ per hr auto workers now receive as extra cost of living pay be made basic pay.

This in part might be conceded by the industry on the theory that such a recession is unlikely. In itself it might have no immediate cost while it improves relations.

Second demand is for higher pensions for 22,170 retired auto workers. It is estimated that $20 per month more would restore what UAW believes is the loss in purchasing power of employees who retired on a maximum of $125 a month, including social security.

Also Asked—Next point is a 1¢ boost in the present annual im-

UAW Scoreboard

	THEY HAVE	THEY WANT
Wages	Average base about $1.75, plus 25¢ living cost factor, giving average wage of $2.	*Same level maintained, but base pay raised 20¢ per hr to $1.95.*
Pensions	Maximum of $125 per month.	*Boost maximum about $20.*
Improvement Factor	4¢ annually.	*Raised to 5¢ annually.*
Retirement	Optional at 65, compulsory at 68.	*Compulsory retirement eliminated.*

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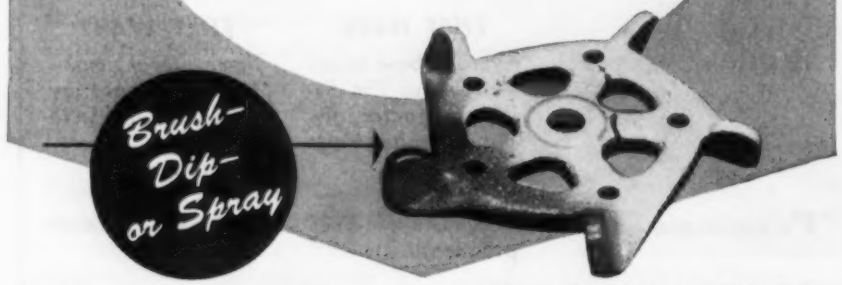

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5-Gallon Cans	$2.50 per gal.	(50 gallons or more) $2.00 per gal.	$13.00 per gal.	(50 gallons or more) $10.00 per gal.	$7.50 per gal.	(50 gallons or more) $7.00 per gal.

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provement factor, now standing at 4¢. All workers gain this annual wage boost in recognition of increased productivity.

Also demanded is the abolition of compulsory retirement provisions in pension agreements. Employees today may retire at 65 and must quit at 68. The union wants them to work as long as they desire. Because of the current manpower shortage in the auto industry, particularly among skilled laborers, this also might be conceded by the automakers as not impractical today.

Final point is an adjustment in wage rates of skilled labor to maintain a historical wage differential.

STRIKES:

Most man-days lost through labor stoppages in 1952 since 1946.

Largely as a result of the steel strike, more man-days of idleness resulted from strikes during 1952 than in any previous year since 1946.

According to the Labor Dept. year-end report, during the year there were 4950 strikes involving 3.5 million workers, and these resulted in 55 million man-days of lost time.

Dubious Merit — The steel strike was outstanding in a negative way. It was the biggest, involving 560,000 workers. It was also responsible for 40 pct of strike idleness, some 23.8 million man-days. It was exceeded in length only by the 88-day strike at International Harvester.

Four other strikes caused more than 1 million man-days of idleness each. They were the 12-day strike of 300,000 bituminous coal miners, a 60-day construction strike on the West Coast, the 53-day telegraph strike, and a 23-day construction strike in the Midwest.

Other major stoppages affecting the metalworking industry included the 21-day Lockheed strike involving 23,000 workers, the 34-day Timken strike of 13,000 employes, and the 14-day strike at Douglas Aircraft involving 11,000 workers.

INSTRUMENTS: Radiation Field Grows

Almost unknown before '47, atomic detection device sales now run $20 million yearly . . . Government orders 80 pct . . . Civilian industry use grows fast—By *A. K. Rannells.*

Atomic explosions over Hiroshima and Nagasaki in 1945 were then, and even later, regarded mainly as unmasking of a new development in modern warfare.

But, equally important, they also unlocked the door to new and revolutionary industrial techniques and processes. Atomic energy development paved the way for creation of entirely new industries.

AEC Helps—Radiation instrument manufacture is a good example. Virtually unknown before 1947, the ensuing 5-year period has seen this industry develop and expand into a $20 million project.

Basic use of such equipment, of course, lies with the government at the present time. Thus, growth of this industry roughly parallels development and expansion of atomic energy programs since 1946. The government provides about 80 pct of the current market.

Growing Fast—This has meant rapid growth. From just a few companies, the industry has expanded to the point where there are at least 80 firms engaged in varying degrees in the manufacture of such items. More than 2400 workers were so employed last year, AEC estimates.

Currently, military agencies provide about one-half the basic market. AEC itself together with its contractors takes an additional 30 pct of the industry's output. Remaining production finds a ready market with industry, hospitals, research laboratories, prospectors and mining firms, and other sources.

More Civilian Use—This private market is expanding, AEC finds after an extensive survey. Many industrial applications have been developed and are in use. More are on the way.

Geiger counters are perhaps best known of such instruments in use today. They find a ready market with mining interests and individual prospectors. But there are other varied uses.

Of specific interest to the metal industries is their application and use for measuring the height of molten metal in furnaces. Another use is the detection of flaws in metals. Still a third application is use of radioactive materials and measuring gages to determine the amount of wear of moving parts.

Check Auto Wear—In the automotive field, AEC says there is a growing use of radiation detection and measuring instruments for determining wear in tires, gears and pistons.

Radiation gages are used in connection with radioactive materials to measure thickness of copper and other sheet. This can be conducted as a continuous operation without touching the metal.

There is a growing use by pipeline companies. Perhaps the most common is determination of the grades and types of oil flowing past a specific point.

More Coming—These are only some of the specific uses for radiation instruments. Their application in hospitals and research laboratories are too numerous for coverage here.

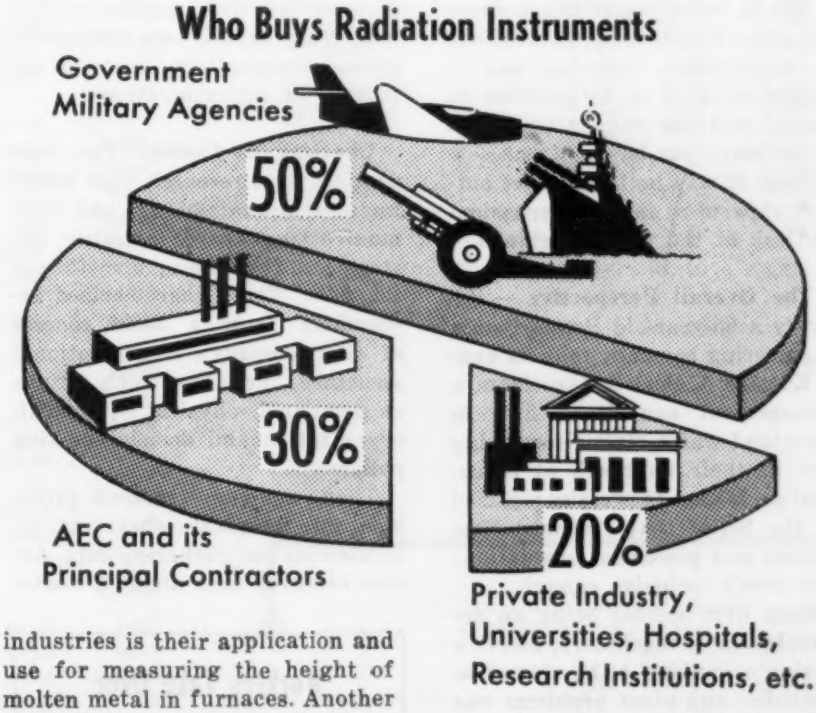
Many more uses are under development by researchers, will find application in new fields.

About 50 pct of the radiation instrument industry's output is produced by seven of the larger companies. Each does more than $1 million worth of business a year.

Remainder of the industry's capacity is spread among 70 to 75 smaller firms, most of them with a good volume of business. Some are preparing to expand.

For Free—This is being made easy by the government which will issue royalty-free licenses to use its patents if a firm can qualify.

Some 50 or more patents in the field of radiation instruments are owned by the United States government. Latest available figures showed a total of 51 non-exclusive, royalty-free licenses on these patents issued to private industry.



PLANT STUDY: Picking Out the Flaws

Management consultant sees Pennsylvania firm's afflictions with an overall approach . . . Plant is living organism, needs on-scene attention . . . How experts do it—By *R. M. Lorz.*

Sometimes you can't see the forest for the trees — and while a firm continues making respectable profits, its executives may have that uncertain feeling that things could be running better. Perhaps a major housecleaning is not needed—usually it isn't.

But in every organization there are some burrs, some dislocations in departments that no one is aware of or is in no position to touch. And the cumulative effect of too many can be dangerous.

Then it may be time to get outside experts to take a dispassionate look at the firm's workings.

The Overall Perspective — Recently a 65-year-old Pennsylvania engineering company took its case to Edward A. Berk & Associates, a management consultant firm in Cleveland which claims something new in their approach to industrial problems. This claim is based on the belief that standard time studies and piecemeal evaluations just aren't inclusive enough.

Each firm besides being an accumulation of machinery, etc, is a "living organism" to be viewed as a whole—and plant problems can only be properly studied in the plant.

Berk & Associates is made up of 40 research scientists who work in groups coordinated by administrative scientist K. Theodore Korn. Men on this staff are all professional authorities in such diverse fields as mathematics, marketing, industrial engineering psychology, sociology, semantics, communications and many other fields.

What's Wrong?—How did Berk do its evaluation job for the Pennsylvania firm? First it noted that the profit rate was sound, backlog of orders was substantial, and the company wished to shape up for shifting economic situations.

Once they had agreed to let researchers go through their plant with no holds barred, key personnel took a battery of tests aimed at pinpointing general competency and fitness. Then Mr. Korn selected a team which included an industrial engineer, a clinical psychologist, an industrial psychologist, a marketing expert, two methodologists, a semanticist, and an authority on communications.

Charting Its Course—The team first set up a research plan which included organizational and communications charts showing the static and functioning structure of the firm. These charts helped researchers form a basic concept of the company's organizational structure, including such things as personnel, physical equipment, organization and decision-making policies.

Then, a 9-man research group went into the plant—observing, interviewing and gathering data. Active research took about 2 weeks.

Workers Take Over

Employees of the Cleveland Pneumatic Tool Co., Cleveland, went into business for themselves this week by purchasing all of the firm's stock. Two employee profit sharing trusts signed agreement to pay Sixty Trust Co., Boston, $11,803,000 for the firm's holdings.

Down payment of $2,150,000 will come from funds already accumulated in the employee trusts.

In the past 3 years, profit sharing under the trust plan has given employees about 20 pct of their base earnings. As complete owners, the former employees will acquire an estimated 35 pct of the base earnings in profits this year.

During that time daily meetings were held at the end of each research day to give team members an opportunity to discuss findings.

Daily assignments were outlined following discussions and a cohesive group viewpoint emerged.

First Clear Look—Presence of the research team in the plant had an immediate effect according to one top executive. He told THE IRON AGE his people began to take their first look at the company as a team because of the air-clearing discussions researchers launched.

After active research was completed the team spent 2 months analyzing its findings. Individual members then turned in reports detailing problems and suggesting alternatives. These were merged into a single 158-page report which was submitted to the president and executive vice-president of the client firm.

The research team uncovered many problems and outlined them in detail. They included instances of inefficient materials handling, improper use of plant space with suggestions for increasing work areas, failure to spell out job responsibilities, need for standardization of equipment and—at the top of the list—a paternalistic management attitude which was breeding a society of "yes men."

No Premium on Push — This problem was emphasized as being especially important since one man was making most of the decisions and was failing to delegate authority. One result was a hiring program which placed a premium on conformity and killed initiative.

The setup also tended to separate personnel into cliques which fostered injurious rivalries and hampered efficient teamwork. In its report the research team suggested that the top man might be relieved of the load by delegating authority and revamping decision —making policies down the line.

Standardization of equipment, purchasing of better materials, installation of a mathematical system for profit evaluation were just some of the concrete suggestions.

STEEL: Chicago Pressing Pittsburgh

Added most new capacity in '52 . . . Now has 19.40 pct of U.S. total against Pittsburgh's 20.02 pct . . . Fairless Works puts Philadelphia in show position . . . Cleveland, South move up.

Steel capacity in the U. S. grew 8,934,800 tons during 1952, more than doubling the increase of the previous year. The Chicago district led the race by constructing 28.48 pct of all new U. S. facilities. Next four were Philadelphia with 15.01 pct, Cleveland with 9.40 pct, the West with 8.58 pct, and Pittsburgh with 8.56 pct of the country's total. All areas showed gains except Wheeling, which remained unchanged.

Basis of this new compilation of steelmaking facilities by IRON AGE districts is the detailed official capacity report just published by the American Iron & Steel Institute. The report gives capacity already installed or very near completion as of Jan. 1, 1953.

Deck Shuffled—While there were no startling changes in the order of the districts, three areas climbed one notch higher. Philadelphia took over the third spot from Youngstown; Cleveland is now sixth in place of Buffalo; and the South beat Wheeling for ninth position.

Chicago, by virtue of its 2,552,100-ton gain, is now pressing Pittsburgh for leadership in the steel industry. This district added both the most openhearth capacity (2,211,100 tons) and the most electric furnace capacity (671,000 tons).

Biggest percentage gain within a district occurred in Cleveland, where the three producers boosted themselves by 15.72 pct, all openhearth.

U. S. Steel Co.'s big new Fairless Works kicked the Philadelphia area into third position by adding 1,200,000 tons of the 1,326,000 tons of new openhearth capacity built in the district. When completed, the mill will have a 1,800,000-ton capacity.

Youngstown, which relinquished the third spot, was the only district with a decrease in openhearth facilities. But enough electric furnaces came in to hold the area's number one position as a producer of this type steel.

Openhearth steelmaking just about maintained its relative position from the previous year, jumping to over 100 million tons for the first time. New openhearths added 7,704,200 tons (8.11 pct) to this category for a total of 102,677,980 tons per year or 87.35 pct of the total. Openhearth capacity in 1952 was 87.46 pct of the total.

Still Climbing—Electric furnace facilities passed the 10-million-ton mark for the first time. Illustrating the electric furnace's popularity was a gain from 7.58 pct to 8.69 pct of the nation's total capacity. Tonnage increase was 1,974,600 tons (23.98 pct) over 1952.

Bessemer steelmaking continued its decline, with capacity falling 744,000 tons or 13.83 pct. It now represents only 3.94 pct of total capacity as compared to 4.96 pct a year ago. Total bessemer capacity is now only 4,637,000 tons.

Spending by the steel industry for expansion and improvement totaled $1.17 billion in 1952, bringing total postwar capital expenditure to over $4.6 billion for the years 1946 to 1952. In the same 7-year period, steelmaking capacity has grown more than 25.6 million tons.

More Coming—About $1 billion will be spent this year in pushing up facilities by another 4 million tons or so. Meeting present expansion goals will put U. S. steelmaking capacity over 123 million tons.

IRON AGE DISTRICT CHANGES AT A GLANCE

IRON AGE District	Pct of Total Capacity 1953	Pct of Total Capacity 1952	Tonnage Increase	Pct of Total Increase	District Increase (Pct)	District Changes (Pct) By Type Furnace: Openhearth	Bessemer	Electric & Crucible
Pittsburgh	20.02	20.96	767,300	8.56	3.37	+ 4.93	−31.84	+10.90
Chicago	19.40	18.65	2,552,100	28.48	12.60	+12.13	−39.76	+56.57
Philadelphia	12.62	12.42	1,344,600	15.01	9.97	+10.59	0.00	+ 2.92
Youngstown	11.62	12.42	173,700	1.94	1.29	− 1.05	0.00	+16.32
West	7.15	7.03	768,500	8.58	10.07	+ 8.20	.....	+21.27
Cleveland	5.27	4.93	842,000	9.40	15.72	+19.57	− 3.33	.....
Buffalo	5.27	5.03	732,000	8.17	13.41	+13.62	.....	0.00
Detroit	4.94	4.72	675,520	7.54	13.17	+17.10	.....	+ 1.21
South	3.98	3.81	547,500	6.11	13.24	+10.69	.....	+90.52
Wheeling	3.82	4.14	0	0.00	0.00	0.00	0.00	.....
S. Ohio R.	3.45	3.43	329,840	3.68	8.86	+ 1.68	.....	+49.33
St. Louis	1.84	1.85	150,000	1.67	7.46	0.00	.....	First installed
East	0.60	0.60	51,740	0.58	7.98	0.00	.....	+56.26
Total	.....	.....	8,934,800	.....	8.25	+ 8.11	−13.83	+23.98

Ingot Capacity by D

Source: Th

DISTRICT — COMPANY	Rated Annual C 1953	1952
Pittsburgh		
Allegheny Ludlum Steel Corp.	746,700	746,700
American Locomotive Co.	103,000	103,000
American Steel & Wire Div.	900,000	900,000
Armco Steel Corp.	474,000	474,000
Babcock & Wilcox Tube Co.	229,450	133,450
Bethlehem Steel Co.	2,100,000	2,100,000
Braeburn Alloy Steel Corp.	20,730	20,730
Byers, A. M. Co.	75,000	75,000
Colonial Steel Co.	28,020	7,020
Crucible Steel Co.		
La Belle		
Midland	1,284,000	1,137,000
Park		
Total	1,284,000	1,137,000
Edgewater Steel Co.	89,890	89,890
Firth Sterling Inc.	20,040	20,040
Heppenstall Steel Co.	55,550	55,550
Jessop Steel Co.	33,490	33,490
Jones & Laughlin Steel Corp.		
Aliquippa	1,764,000	1,764,000
Pittsburgh	3,337,500	2,580,000
Total	5,101,500	4,344,000
Latrobe Steel Co.	24,000	25,200
Mesta Machine Co.	105,000	105,000
National Tube Div.	1,224,000	1,224,000
Pittsburgh Steel Co.	1,320,000	1,072,000
Union Electric Steel Corp.	26,760	26,760
Universal-Cyclops Steel Co.	70,160	70,160
United States Steel Co.		
Clairton	947,000	800,000
Duquesne	1,735,000	2,060,000
Edgar Thompson	2,090,000	2,080,400
Homestead	4,406,000	4,366,000
Johnstown	25,000	24,400
Vandergrift	275,000	550,000
Total	9,478,000	9,860,800
Vanadium-Alloys Steel Co.	11,910	11,910
Vulcan Crucible Co.	9,600	9,600
TOTAL Pittsburgh District	23,532,600	22,765,300
Chicago		
American Locomotive Co.	70,000	70,000
American Steel & Wire Div.	918,000	918,000
Borg-Warner Corp.	84,000	30,000
Columbia Tool Steel Co.	6,600	6,600
Continental Steel Corp.	394,000	394,000
A. Finkle & Sons	33,000	
Inland Steel Co.	4,500,000	3,750,000
International Harvester Co.	1,000,000	900,000
Joslyn Mfg. & Supply Co.	37,500	37,500
Northwestern Steel & Wire Co.	625,000	321,000
Reconstruction Finance Corp.		
South Chicago		
East Chicago		
Total		
Republic Steel Corp.	1,232,000	1,132,000
United States Steel Co.		
Gary	8,593,000	8,264,400
South Works	5,016,000	4,891,000
Total	11,609,000	11,155,400
Youngstown Sheet & Tube Co.	2,702,500	1,326,000
TOTAL Chicago District	22,800,600	20,248,500

cial Steel Industry Capacitie

Source: The American Iron & Steel Institute—Compilations: The Iron Age

Ingot Capacity by Districts

ittsburgh

DISTRICT—COMPANY	Rated Annual Capacity—Net Tons				
	1953	1952	1951	1948	1945
Allegheny Ludlum Steel Corp.	746,700	746,700	766,860	430,860	394,860
American Locomotive Co.	103,000	103,000	103,000	103,000	103,000
American Steel & Wire Div.	900,000	900,000	900,000	842,000	842,000
Armco Steel Corp.	474,000	474,000	474,000	432,000	591,000
Babcock & Wilcox Tube Co.	229,450	133,450	64,800	50,400	50,400
Bethlehem Steel Co.	2,100,000	2,100,000	2,028,000	1,900,000	1,900,000
Braeburn Alloy Steel Corp.	20,730	20,730	20,730	20,730	20,730
Byers, A. M. Co.	75,000	75,000	75,000	150,000	150,000
Colonial Steel Co.	29,820	7,020	7,020	7,020	7,020
Crucible Steel Co.					
La Belle	.....	.....	.....	.....	3,780
Midland	1,284,000	1,137,000	1,095,000	997,950	1,034,400
Park	.....	.....	.....	183,100	181,500
Total	1,284,000	1,137,000	1,095,000	1,181,050	1,219,680
Edgewater Steel Co.	89,890	89,890	146,470	140,170	140,170
Firth Sterling Inc.	20,040	20,040	20,040	20,040	17,540
Heppenstall Steel Co.	55,550	55,550	42,880	46,580	42,560
Jessop Steel Co.	33,490	33,490	41,560	50,000	50,000
Jones & Laughlin Steel Corp.					
Aliquippa	1,764,000	1,764,000	1,764,000	1,764,000	1,764,000
Pittsburgh	3,337,500	2,580,000	2,137,500	2,137,500	2,233,500
Total	5,101,500	4,344,000	3,901,500	3,901,500	3,997,500
Latrobe Steel Co.	24,000	25,200	12,000	12,000	12,000
Mesta Machine Co.	105,000	105,000	105,000	105,000	105,000
National Tube Div.	1,224,000	1,224,000	1,164,000	1,164,000	1,200,000
Pittsburgh Steel Co.	1,320,000	1,072,000	1,072,000	1,072,000	1,072,000
Union Electric Steel Corp.	26,760	26,760	26,760	21,000	25,200
Universal-Cyclops Steel Co.	70,160	70,160	54,120	54,120	54,120
United States Steel Co.					
Clairton	947,000	900,000	870,000	805,000	805,000
Duquesne	1,735,000	2,060,000	1,942,800	1,742,800	2,146,800
Edgar Thompson	2,090,000	2,080,400	2 080,400	1,753,000	2,297,000
Homestead	4,406,000	4,366,000	4,866,000	4,279,000	4,732,000
Johnstown	25,000	24,400	24,400	24,400	24,400
Vandergrift	275,000	550,000	480,000	500,000	500,000
Total	9,478,000	9,980,800	10,263,600	9,104,200	10,552,200
Vanadium-Alloys Steel Co.	11,910	11,910	11,910	11,910	11,910
Vulcan Crucible Co.	9,600	9,600	9,600	9,600	9,600
TOTAL Pittsburgh District	23,532,600	22,765,300	22,405,850	20,829,180	22,521,400

hicago

American Locomotive Co.	78,000	78,000	78,000	78,000	78,000
American Steel & Wire Div.	918,000	918,000	918,000	690,000	610,400
Borg-Warner Corp.	64,000	30,000	28,350	24,000	24,000
Columbia Tool Steel Co.	6,600	6,600	6,600	6,600	6,600
Continental Steel Corp.	394,000	394,000	393,760	364,000	364,000
A. Finkle & Sons	33,000	.....	.....	.....	.....
Inland Steel Co.	4,500,000	3,750,000	3,750,000	3,400,000	3,400,000
International Harvester Co.	1,000,000	900,000	900,000	900,000	900,000
Joslyn Mfg. & Supply Co.	37,500	37,500	37,500	37,500	37,500
Northwestern Steel & Wire Co.	625,000	321,000	321,000	321,000	321,000
Reconstruction Finance Corp.					
South Chicago	.....	.....	.....	.....	80,000
East Chicago	.....	.....	.....	120,000	120,000
Total	.....	.....	.....	120,000	200,000
Republic Steel Corp.	1,232,000	1,132,000	1,100,000	1,225,000	1,301,000
United States Steel Co.					
Gary	6,593,000	6,264,400	6,025,700	5,718,800	5,718,800
South Works	5,016,000	4,891,000	4,675,000	4,525,000	4,525,000
Total	11,609,000	11,155,400	10,700,700	10,243,800	10,243,800
Youngstown Sheet & Tube Co.	2,103,500	1,526,000	1,526,000	1,446,000	1,446,000
TOTAL Chicago District	22,800,600	20,248,500	19,759,910	18,855,900	18,932,300

DISTRICT—COMPANY	Rated Annual Capacity—Net Tons				
	1953	1952	1951	1948	1945
Philadelphia					
Alan Wood Steel Co.	625,000	625,000	550,000	550,000	550,000
Armco Steel Corp. (Rustless Iron & Steel Div.)	102,000	102,000	102,000	95,000	114,000
Baldwin-Lima-Hamilton Corp.	169,960	169,960	149,300	149,300	169,930
Bethlehem Steel Co.					
Bethlehem	3,148,000	3,128,000	3,080,000	2,585,000	2,503,000
Sparrows Point	5,400,000	5,400,000	5,160,000	4,651,000	4,075,000
Steelton	1,312,000	1,312,000	1,032,000	886,000	740,000
Total	9,860,000	9,840,000	9,272,000	8,122,000	7,318,000
Boiardi Steel Corp.	53,700	53,700	50.760	.....	.....
Carpenter Steel Co.	85,800	85,800	81,360	74,880	74,880
Central Iron & Steel Co.	406,000	406,000	406,000	288,000	336,000
Claymont Steel Corp. (C.F.&I.)	494,570	468,000	468,000	460,000	460,000
Henry Disston & Sons, Inc.	25,000	25,000	25,000	25,000	25,000
Eastern Stainless Steel Co.	32,000	14,400	12,000	.....	.....
Harrisburg Steel Corp.	100,750	100,750	100.750	100,750	100,750
Lukens Steel Co.	675,000	675,000	675,000	624,000	624,000
Midvale Co.	324,950	274,650	417,370	523,770	519,370
Newport News Shipbuilding & Drydock Co.	12,000	12,000	12,000	7,500	7,500
Phoenix Iron & Steel Co.	432,000	432,000	431,430	231,400	231,400
J. A. Roebling's Sons Co. (C.F&I.)	235,000	204,870	204,870	253,000	253,000
United States Steel Co.	1,200,000	.....	.....	.....	.....
TOTAL Philadelphia District	14,633,730	13,489,130	12,957,840	11,504,600	10,783,830

Valley (Youngstown)

Copperweld Steel Co.	618,380	618,380	554,400	450,000	321,360
Damascus Tube Co.	1,800	1,800	1,800	.....	.....
Empire Steel Co.	455,000	409,300	390,320	369,730	348,540
Industrial Forge & Steel, Inc.	48,600	48,600	48,600	50,000	50,000
Reconstruction Finance Corp.	.....	.....	360,000*	360,000*	.....
Republic Steel Corp.					
Canton	1,125,000	1,125,000	975,000	775,000	1,445,000
Massillon	620,000	620,000	610,000	610,000	610,000
Warren	900,000	900,000	900,000	860,000	950,000
Youngstown	2,142,000	2,142,000	2,130,000	2,150,000	2,350,000
Total	4,787,000	4,787,000	4,615,000	3,395,000	5,355,000
Sharon Steel Co.					
Farrell	1,000,000	1,000,000	981,400	1,000,000	1,050,000
Lowellville	550,000	550,000	460,000	572,000	636,000
Timken Roller Bearing Co.	625,200	547,200	547,200	547,200	547,200
United States Steel Co.					
Youngstown	2,734,000	2,684,000	2,484,000	2,344,000	2,344,000
Youngstown Sheet & Tube Co.					
Brier Hill	1,182,000	1,182,000	1,182,000	1,104,000	1,104,000
Campbell	1,662,000	1,662,000	1,542,000	1,452,000	1,452,000
Total	2,844,000	2,844,000	2,724,000	2,556,000	2,556,000
TOTAL Valley District	13,663,980	13,490,280	13,166,720	12,643,930	13,208,100

* Idle capacity formerly reported with Republic at Canton.

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DISTRICT—CO

Western

Bethlehem Pacific Co.
Los Angeles
San Francisco
Seattle
Total
Cameron Iron Wo
Colorado Fuel & I
Columbia-Geneva
Geneva
Pittsburg
Torrance
Total
General Service
Hoster Steel Corp
Isaacson Iron Wo
Judson Steel Co.
Kaiser Steel Corp
R. G. Le Tourneau
National Supply C
Northwest Steel R
Oregon Steel Mill
Pacific States Ste
Seidelhuber Steel Co.
Sheffield Steel Co
Sands Springs
Houston
Total
Southwest Steel F
Texas Steel Corp.
TOTAL West

Cleveland

Jones & Laughlin
National Tube Di
Republic Steel Co
TOTAL Clev

Buffalo

Allegheny Ludlum Dunkirk
Tonawanda
Total
Bethlehem Steel
Erie Forge Co.
Erie Forge & Ste
National Forge &
Republic Steel Co
Simonds Saw & S
Colorado Fuel &
TOTAL Buff

Detroit

Allegheny Ludlum
Ford Motor Co.
Great Lakes Stee
McLouth Steel Co
Rotary Electric S
TOTAL Detr

ities

DISTRICT—COMPANY	Rated Annual Capacity—Net Tons				
	1953	1952	1951	1948	1945
Western					
Bethlehem Pacific Coast Steel Co.					
Los Angeles	402,000	384,000	324,000	213,000	117,000
San Francisco	252,000	240,000	240,000	235,000	235,000
Seattle	246,000	216,000	216,000	210,000	210,000
Total	900,000	840,000	780,000	658,000	562,000
Cameron Iron Works	58,800	.....	.....	.....	.....
Colorado Fuel & Iron Corp.	1,485,000	1,320,000	1,320,000	1,272,000	1,272,000
Columbia-Geneva Steel Div.					
Geneva	1,675,000	1,600,000	1,440,000	1,283,400	1,283,400
Pittsburg	397,000	364,700	364,700	362,600	416,600
Torrance	214,000	213,700	213,700	208,200	211,000
Total	2,286,000	2,178,400	2,018,400	1,854,200	1,911,000
General Services Adm.	72,300	72,300	.....	.....	.....
Hoster Steel Corp.	16,920	16,920	.....	.....	.....
Isaacson Iron Works	102,000	102,000	101,520	104,400	104,400
Judson Steel Co.	76,500	76,500	76,500	76,500	76,500
Kaiser Steel Corp.	1,536,000	1,380,000	1,200,000	870,000	750,000
R. G. Le Tourneau, Inc.	138,600	.....	.....	.....	.....
National Supply Co.	50,200	63,000	50,400	41,400	45,900
Northwest Steel Rolling Mills	42,000	32,400	32,400	32,400	32,400
Oregon Steel Mills	110,000	110,000	110,000	86,100	60,000
Pacific States Steel Corp.	298,000	232,000	231,300	94,500	88,820
Seidelhuber Steel Rolling Mill Co.	60,000	49,300	.....	.....	.....
Sheffield Steel Corp. (Armco)					
Sands Springs	54,000	54,000	54,000	54,000	54,000
Houston	1,050,000	1,050,000	840,000	560,000	466,000
Total	1,104,000	1,104,000	894,000	614,000	520,000
Southwest Steel Rolling Mills	45,000	36,000	36,000	.....	.....
Texas Steel Corp.	22,320	22,320	22,320	22,320	22,320
TOTAL Western District	8,403,840	7,635,140	6,872,840	5,705,820	5,466,790
Cleveland					
Jones & Laughlin Steel Corp.	1,305,000	1,155,000	945,000	840,000	1,026,900
National Tube Div.	2,320,000	2,300,000	2,250,000	1,884,000	1,944,000
Republic Steel Corp.	2,572,000	1,900,000	1,637,000	1,500,000	1,570,000
TOTAL Cleveland District	6,197,000	5,355,000	4,832,000	4,224,000	4,540,900
Buffalo					
Allegheny Ludlum Steel Co.					
Dunkirk	33,000	33,000	33,000	33,000	33,000
Tonawanda	4,500	4,500	4,500	4,500	4,500
Total	37,500	37,500	37,500	37,500	37,500
Bethlehem Steel Corp.	4,740,000	4,020,000	3,920,000	3,120,000	3,120,000
Erie Forge Co.	234,000	234,000	85,000	80,000	80,000
Erie Forge & Steel Co.	.....	.....	.....	128,950	128,950
National Forge & Ordnance Co.	25,000	25,000	25,000	25,000	25,000
Republic Steel Corp.	882,000	882,000	870,000	830,000	850,000
Simonds Saw & Steel Co.	21,600	21,600	21,600	21,600	21,600
Colorado Fuel & Iron Corp.	252,000	240,000	240,000	180,000	180,000
TOTAL Buffalo District	6,192,100	5,460,100	5,199,100	4,423,050	4,448,470
Detroit					
Allegheny Ludlum Steel Corp.	3,000	3,000	3,000	3,000	3,000
Ford Motor Co.	1,648,200	1,521,280	1,471,940	1,115,100	967,420
Great Lakes Steel Corp.	3,150,000	2,600,000	2,450,000	2,100,000	2,050,000
McLouth Steel Corp.	579,700	581,100	420,000	.....	.....
Rotary Electric Steel Corp.	425,000	425,000	425,000	255,000	170,000
TOTAL Detroit District	5,805,900	5,130,380	4,769,940	3,473,100	3,190,420

DISTRICT—COMPANY	Rated Annual Capacity—Net Tons				
	1953	1952	1951	1948	1945
Southern					
Atlantic Steel Co.	300,000	188,000	188,000	165,000	154,000
Case Co., J. I.	.....	.....	.....	74,400	74,400
Connors Steel Co.	67,500	60,000	60,000	60,000	60,000
Kilby Steel Co.	34,020	34,020	34,020	.....	.....
Knoxville Iron Co.	38,000	38,000	38,000	38,000	38,000
Republic Steel Co.	789,000	789,000	745,000	650,000	715,000
Tennessee Coal Iron Div.					
Ensley	1,625,000	1,625,000	1,568,000	1,568,000	1,568,000
Fairfield	1,830,000	1,402,000	1,352,000	1,282,000	1,092,000
Total	3,455,000	3,027,000	2,920,000	2,850,000	2,660,000
TOTAL Southern District	4,683,520	4,136,020	3,985,020	3,837,400	3,701,400
Wheeling					
Ohio River Steel Div.	136,080	136,080	121,200	136,080	126,000
National Steel Corp.					
Weirton Steel Co.	2,500,000	2,500,000	2,300,000	1,950,000	1,850,000
Wheeling Steel Corp.					
Benwood	420,000	420,000	420,000	336,000	336,000
Steubenville	1,440,000	1,440,000	1,440,000	1,073,000	1,008,000
Total	1,860,000	1,860,000	1,860,000	1,409,000	1,344,000
TOTAL Wheeling District	4,496,080	4,496,080	4,281,200	3,495,080	3,320,000
South Ohio River					
Armco Steel Corp.					
Ashland	860,000	860,000	900,000	828,000	783,000
Middletown	1,548,000	1,505,000	1,540,000	972,000	948,000
Total	2,408,000	2,365,000	2,440,000	1,800,000	1,731,000
Detroit Steel Corp.	660,000	650,000	650,000	720,000	616,000
Green River Steel Corp.	196,000	.....	.....	.....	.....
Newport Steel Corp.	708,500	708,500	704,700	413,100	413,100
West Virginia Steel & Mfg. Co.	75,840	.....	.....	.....	.....
TOTAL South Ohio District	4,053,340	3,723,500	3,794,700	2,933,100	2,760,100
St. Louis					
Granite City Steel Co.	720,000	720,000	720,000	620,000	703,200
Keystone Steel & Wire Co.	400,000	400,000	325,000	302,400	302,400
Laclede Steel Co.	410,000	410,000	397,840	326,020	326,020
Sheffield Steel Corp. (Armco)	630,000	480,000	420,000	426,000	426,000
TOTAL St. Louis District	2,160,000	2,010,000	1,862,840	1,674,420	1,757,620
Eastern					
Allegheny Ludlum Steel Co.	77,000	30,000	25,000	25,000	25,000
American Steel & Wire Div.	275,000	275,000	250,000	250,000	280,000
Crucible Steel Co. of America					
Harrison	7,100	2,360	2,160	4,800	210,000
Syracuse	59,600	59,600	56,280	67,800	24,000
Halcomb	.....	.....	.....	.....	84,000
Total	66,700	61,960	58,440	72,600	288,000
Stanley Works	188,280	188,280	188,280	188,280	188,280
Washburn Wire Co.	93,000	93,000	93,000	60,000	60,000
Wickwire Brothers, Inc.	.....	.....	.....	38,000	38,000
TOTAL Eastern District	699,980	648,240	614,720	633,880	879,280

UNIVERSITY OF MICHIGAN

THE IRON AGE DISTRICTS STEEL CAPACITY

In Thousands of Net Tons—*Source: The American Iron & Steel Institute—Compilations: The Iron Age*

District	1953		1952		1951		1948		1945	
	Net Tons	Pct of Total	Net Tons	Pct of Total	Net Tons	Pct of Total	Net Tons	Pct of Total	Net Tons	Pct of Total
Pittsburgh	23,533	20.02	22,765	20.96	22,406	21.44	20,829	22.10	22,521	23.58
Chicago	22,801	19.40	20,249	18.65	19,760	18.91	18,856	20.01	18,932	19.82
Philadelphia	14,834	12.62	13,489	12.42	12,958	12.40	11,505	12.21	10,784	11.29
Youngstown	13,664	11.62	13,490	12.42	13,167	12.60	12,644	13.42	13,208	13.83
Western	8,404	7.15	7,635	7.03	6,878	6.58	5,706	6.06	5,467	5.72
Cleveland	6,197	5.27	5,355	4.93	4,832	4.62	4,224	4.48	4,541	4.75
Buffalo	6,192	5.27	5,460	5.03	5,200	4.98	4,423	4.69	4,443	4.65
Detroit	5,806	4.94	5,130	4.72	4,770	4.56	3,473	3.69	3,190	3.34
Southern	4,683	3.98	4,136	3.81	3,985	3.81	3,837	4.07	3,701	3.88
Wheeling	4,496	3.82	4,496	4.14	4,281	4.10	3,495	3.71	3,320	3.48
South Ohio River	4,053	3.45	3,724	3.43	3,795	3.63	2,933	3.11	2,760	2.89
St. Louis	2,160	1.84	2,010	1.85	1,863	1.78	1,674	1.78	1,758	1.84
Eastern	700	0.60	648	0.60	615	0.59	634	0.67	879	0.92
Total	117,522	100.00	108,588	100.00	104,503	100.00	94,233	100.00	95,503	100.00

Annual Capacity of Blast Furnaces as of January 1, 1953

	PIG IRON		FERROALLOYS		Total annual capacity (N. T.)
	No. of stacks	Annual capacity (N. T.)	No. of stacks	Annual capacity (N. T.)	
Companies:					
Alan Wood Steel Company	2	454,800	...	.....	454,800
Armco Steel Corporation	5	1,341,000	...	.....	1,341,000
Sheffield Steel Corporation	1	300,000	...	.....	300,000
TOTAL	6	1,641,000	...	.....	1,641,000
Barium Steel Corporation:					
Chester Blast Furnace, Inc.	1	200,000	...	.....	200,000
Bethlehem Steel Company	30	11,284,000	2	216,000	11,500,000
Colorado Fuel and Iron Corporation	7	1,501,200	...	.....	1,501,200
Crucible Steel Company of America	3	895,000	...	.....	895,000
Detroit Steel Corporation	1	264,700	...	.....	264,700
Eastern Gas and Fuel Associates	1	191,100	...	.....	191,100
Ford Motor Company	3	1,039,120	...	.....	1,039,120
Globe Iron Company	...	.....	1	100,000	100,000
Granite City Steel Co.	2	450,000	...	.....	450,000
Inland Steel Company	8	2,638,950	...	.....	2,638,950
Interlake Iron Corporation	6	1,402,670	...	.....	1,402,670
International Harvester Company	3	731,000	...	.....	731,000
Jackson Iron & Steel Company	...	.....	1	93,000	93,000
Jones & Laughlin Steel Corporation	13	4,412,000	...	.....	4,412,000
Kaiser Steel Corporation	2	876,000	...	.....	876,000
Lavino & Company, E. J.	...	.....	2	112,000	112,000
Lone Star Steel Company	1	385,000	...	.....	385,000
National Steel Corporation:					
Great Lakes Steel Corporation	4	1,680,000	...	.....	1,680,000
Hanna Furnace Corporation	3	680,000	1	120,000	800,000
Weirton Steel Company	4	2,000,000	...	.....	2,000,000
TOTAL	11	4,360,000	1	120,000	4,480,000
New Jersey Zinc Company	...	.....	2	112,000	112,000
Newport Steel Corporation	1	136,800	...	.....	136,800
Pittsburgh Coke & Chemical Company	3	836,500	...	.....	836,500
Pittsburgh Steel Company	3	954,000	...	.....	954,000
Republic Steel Corporation	22	7,220,000	...	.....	7,220,000
Sharon Steel Corporation	3	709,620	...	.....	709,620
Shenango Furnace Company	2	423,100	...	.....	423,100
Sloss-Sheffield Steel & Iron Division of United States Pipe & Foundry Co.	4	491,710	...	.....	491,710
Tennessee Products & Chemical Corp.	3	217,740	...	.....	217,740
Tonawanda Iron Division	1	171,000	...	.....	171,000
United States Steel Corporation:					
United States Steel Corp. (Central Operations)	51	18,700,500	4	335,400	19,035,900
American Steel & Wire Division	6	1,429,400	.....	.....	1,429,400
Columbia-Geneva Steel Division	5	1,682,700	.....	.....	1,682,700

Capacity of Blast Furnaces — January 1, 1953 (*Continued*)

	PIG IRON		FERROALLOYS		Total annual capacity (N. T.)
	No. of stacks	Annual capacity (N. T.)	No. of stacks	Annual capacity (N. T.)	
Companies (*Continued*):					
National Tube Division	9	3,122,800	...	.....	3,122,800
Tennessee Coal & Iron Division	9	2,835,800	(a)	33,500	2,870,300
TOTAL	80	27,772,200	4	368,900	28,141,100
Wheeling Steel Corporation	6	1,678,500	...	.....	1,678,500
Woodward Iron Company	4	772,630	...	.....	772,630
Youngstown Sheet & Tube Company	13	4,148,000	...	.....	4,148,000
GRAND TOTAL	245	78,258,340	13	1,121,900	79,380,240
Plant Location and Operating Company:					
Alabama					
Birmingham					
Republic Steel Corporation	2	456,000	...	.....	456,000
Sloss-Sheffield Steel & Iron Division	2	281,230	...	.....	281,230
Ensley					
Tennessee Coal & Iron Division	6	1,673,100	(a)	33,500	1,706,600
Fairfield					
Tennessee Coal & Iron Division	3	1,163,700	...	.....	1,163,700
Gadsden					
Republic Steel Corporation	2	471,000	...	.....	471,000
North Birmingham					
Sloss-Sheffield Steel & Iron Division	2	210,480	...	.....	210,480
Woodward					
Woodward Iron Company	4	772,630	...	.....	772,630
TOTAL	21	5,028,140	(a)	33,500	5,061,640
California					
Fontana					
Kaiser Steel Corporation	2	876,000	...	.....	876,000
Colorado					
Pueblo					
Colorado Fuel and Iron Corporation	4	960,000	...	.....	960,000
Illinois					
Chicago					
Interlake Iron Corporation	2	448,020	...	.....	448,020
Granite City					
Granite City Steel Co.	2	450,000	...	.....	450,000
South Chicago					
International Harvester Company	3	731,000	...	.....	731,000
Republic Steel Corporation	1	455,000	...	.....	455,000
United States Steel Corp. (Central Operations)	11	4,196,700	...	.....	4,196,700
Youngstown Sheet and Tube Company	3	684,000	...	.....	684,000
TOTAL	22	6,964,720	...	.....	6,964,720

Official Steel Industry Capacities

Source: The American Iron & Steel Institute

STEEL CAPACITY BY COMPANIES AND

Annual Steel Capacity (Ingots and Steel for Castings) as of January 1, 1953

	OPEN HEARTH		BESSEMER		ELECTRIC AND CRUCIBLE		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
Kinds:							
Open hearth—basic	937	101,874,627					101,874,627
Open hearth—acid	34	803,353					803,353
Bessemer			(e) 33	4,637,000			4,637,000
Electric					277	10,232,450	10,232,450
Crucible					1	40	40
TOTAL	971	102,677,980	(e) 33	4,637,000	278	10,232,490	117,547,470
Companies:							
Alan Wood Steel Co.	8	625,000					625,000
*Allegheny Ludlum Steel Corporation	6	240,000			35	649,200	889,200
American Locomotive Co.	6	181,000					181,000
Armco Steel Corporation	25	2,588,000			9	396,000	2,984,000
Sheffield Steel Corp.	14	1,434,000			2	300,000	1,734,000
TOTAL	39	4,022,000			11	696,000	4,718,000
Atlantic Steel Company	3	188,000			1	112,000	300,000
Babcock & Wilcox Company					4	239,450	239,450
Baldwin-Lima-Hamilton Corp.	5	169,920			(a) 1	40	169,960
Barium Steel Corporation:							
Central Iron & Steel Co.	5	360,600			1	46,000	406,600
Industrial Forge & Steel, Inc.	2	48,600					48,600
Phoenix Iron & Steel Co.	6	432,000					432,000
TOTAL	13	840,600			1	46,000	886,600
Bethlehem Steel Corp:							
Bethlehem Steel Co.	127	16,206,000	3	336,000	4	158,000	16,700,000
Bethlehem Pacific Coast Steel Corp.	10	498,000			3	402,000	900,000
TOTAL	137	16,704,000	3	336,000	7	560,000	17,600,000
Borg-Warner Corporation					4	64,000	64,000
Boiardi Steel Corp.					2	53,700	53,700
Braeburn Alloy Steel Corp.					2	30,730	30,730
Byers Company, A. M.					2	75,000	75,000
Cameron Iron Works, Inc.					2	58,800	58,800
Carpenter Steel Company					7	85,800	85,800
Colorado Fuel & Iron Corp.	27	2,231,570					2,231,570
Roebling's Sons Corp., J. A.	9	235,000					235,000
TOTAL	36	2,466,570					2,466,570

* Since publication of above figures, Company has revised electric furnace capacity downward to 624,200 tons.

Steel Capacity (Ingots and Steel for Castings) January 1, 1953 (*Continued*)

	OPEN HEARTH		BESSEMER		ELECTRIC AND CRUCIBLE		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
Companies (*Continued*):							
Columbus Tool Steel Co.					2	6,600	6,600
Connors Steel Co.					3	67,500	67,500
Continental Steel Corp.	5	394,000					394,000
Copperweld Steel Co.					7	618,380	618,380
Crucible Steel Company of America	10	972,000			17	378,700	1,350,700
(b) Damascus Tube Co.					3	1,800	1,800
Detroit Steel Corp.	10	660,000					660,000
Disston & Sons, Inc., Henry					2	25,000	25,000
Eastern Stainless Steel Corp.					3	32,000	32,000
Edgewater Steel Co.	3	89,800					89,800
Empire Steel Corporation	7	455,000					455,000
Erie Forge & Steel Corp.	5	234,000					234,000
Funkl & Sons Co., A.					2	33,000	33,000
Firth Sterling Inc.					3	20,040	20,040
(b) Hooter Steel Corporation	10	1,370,200			17	278,000	1,648,200
(b) General Services Administration	2	60,080			1	12,300	72,380
Granite City Steel Co.	13	720,000					720,000
Green River Steel Corp.					3	198,000	198,000
Harrisburg Steel Corp.	3	100,750					100,750
Heppenstall Company	2	50,470			1	5,080	55,550
(b) Hooter Steel Corporation					1	18,920	18,920
Inland Steel Company	40	4,500,000					4,500,000
International Harvester Company	11	1,000,000					1,000,000
Isaacson Iron Works					2	102,000	102,000
Jessop Steel Company					4	33,490	33,490
Jones & Laughlin Steel Corporation	38	5,823,000	3	582,000	1	1,500	6,406,500
Joslyn Mfg. & Supply Co.					3	37,500	37,500
Judson Steel Corporation	3	76,500					76,500
Kaiser Steel Corp.	9	1,536,000					1,536,000
Keystone Steel & Wire Co.	4	400,000					400,000
Kilby Steel Company					3	34,020	34,020
Knoxville Iron Company					2	38,000	38,000
Laclede Steel Company	4	410,000					410,000
Latrobe Steel Company					5	24,000	24,000
Le Tourneau, Inc., R. G.					3	138,600	138,600
Lukens Steel Company	12	675,000					675,000
McLouth Steel Corporation					4	579,700	579,700
Mesta Machine Company	4	85,000			1	20,000	105,000
Midvale Company	4	184,920			7	140,030	324,950
National Forge & Ordnance Company					3	25,000	25,000
National Steel Corp.:							
Great Lakes Steel Corp.	17	3,150,000	(c) 2				3,150,000
Weirton Steel Co.	13	2,500,000	(c) 2				2,500,000
TOTAL	30	5,650,000	(c) 4				5,650,000

BLAST FURNACE CAPACITY BY COMPANIES AND GEOGRAPHIC LOCATI

Capacity of Blast Furnaces — January 1, 1953 (*Continued*)

	PIG IRON		FERROALLOYS		Total annual capacity (N. T.)
	No. of stacks	Annual capacity (N. T.)	No. of stacks	Annual capacity (N. T.)	
Indiana					
East Chicago					
Youngstown Sheet and Tube Company	3	1,311,200	...	.....	1,311,200
Gary					
United States Steel Corp. (Central Operations)	12	4,755,400	...	.....	4,755,400
Indiana Harbor					
Inland Steel Company	8	2,638,950	...	.....	2,638,950
TOTAL	23	8,705,550	...	.....	8,705,550
Kentucky					
Ashland					
Armco Steel Corporation	3	777,000	...	.....	777,000
Maryland					
Sparrows Point					
Bethlehem Steel Company	8	3,516,000	...	.....	3,516,000
Massachusetts					
Everett					
Eastern Gas and Fuel Associates	1	191,100	...	.....	191,100
Michigan					
Dearborn					
Ford Motor Company	3	1,039,120	...	.....	1,039,120
River Rouge					
Great Lakes Steel Corporation	4	1,680,000	...	.....	1,680,000
TOTAL	7	2,719,120	...	.....	2,719,120
Minnesota					
Duluth					
American Steel & Wire Division	2	449,400	...	.....	449,400
Interlake Iron Corporation	1	131,580	...	.....	131,580
TOTAL	3	580,980	...	.....	580,980
New York					
Buffalo					
Hanna Furnace Corporation	3	680,000	1	120,000	800,000
Republic Steel Corporation	2	618,000	...	.....	618,000
Lackawanna					
Bethlehem Steel Company	7	3,036,000	...	.....	3,036,000
North Tonawanda					
Tonawanda Iron Division	1	171,000	...	.....	171,000
Tonawanda					
Colorado Fuel & Iron Corporation	2	390,000	...	.....	390,000
Troy					
Republic Steel Corporation	1	263,000	...	.....	263,000
TOTAL	16	5,158,000	1	120,000	5,278,000

Capacity of Blast Furnaces — January 1, 1953 (*Continued*)

	PIG IRON		FERROALLOYS		Total annual capacity (N. T.)
	No. of stacks	Annual capacity (N. T.)	No. of stacks	Annual capacity (N. T.)	
Ohio					
Campbell					
Youngstown Sheet and Tube Company	4	1,450,800	...	.....	1,450,800
Canton					
Republic Steel Corporation	1	235,000	...	.....	235,000
Cleveland					
American Steel & Wire Division	2	530,000	...	.....	530,000
Jones & Laughlin Steel Corporation	2	740,000	...	.....	740,000
Republic Steel Corporation	6	2,251,000	...	.....	2,251,000
Hubbard					
Youngstown Sheet and Tube Company	1	200,400	...	.....	200,400
Jackson					
Globe Iron Company	...	.....	1	100,000	100,000
Jackson Iron & Steel Company	...	.....	1	93,000	93,000
Lorain					
National Tube Division	5	1,842,500	...	.....	1,842,500
Lowellville					
Sharon Steel Corporation	1	148,620	...	.....	148,620
Martins Ferry					
Newport Steel Corporation	1	136,800	...	.....	136,800
Massillon					
Republic Steel Corporation	1	238,000	...	.....	238,000
New Miami					
Armco Steel Corporation	2	564,000	...	.....	564,000
Portsmouth					
Detroit Steel Corporation	1	264,700	...	.....	264,700
Steubenville					
Wheeling Steel Corporation	5	1,444,500	...	.....	1,444,500
Struthers					
Pittsburgh Coke & Chemical Company	1	182,500	...	.....	182,500
Toledo					
Interlake Iron Corporation	2	551,180	...	.....	551,180
Warren					
Republic Steel Corporation	1	518,000	...	.....	518,000
Youngstown					
Republic Steel Corporation	5	1,717,000	...	.....	1,717,000
United-States Steel Corp. (Central Operations)	6	2,003,700	...	.....	2,003,700
Youngstown Sheet and Tube Company	2	501,600	...	.....	501,600
TOTAL	49	15,518,300	2	193,000	15,711,300
Pennsylvania					
Aliquippa					
Jones & Laughlin Steel Corporation	5	1,800,000	...	.....	1,800,000
Bethlehem					
Bethlehem Steel Company	7	2,428,000	...	.....	2,428,000
Birdsboro					
Colorado Fuel and Iron Corporation	1	151,200	...	.....	151,200

UNIVERSITY OF MICHIGAN

ry Capacities

Institute

PACITY BY COMPANIES AND TYPES

COKE CAPACITY

AND GEOGRAPHIC LOCATION

Steel Capacity (Ingots and Steel for Castings) January 1, 1953 (*Continued*)

	OPEN HEARTH		BESSEMER		ELECTRIC AND CRUCIBLE		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
(*Continued*):							
Steel Co.					2	6,600	6,600
eel Co.					3	67,500	67,500
Steel Corp.	5	394,000					394,000
Steel Co.					7	618,380	618,380
el Company							
	10	972,000			17	378,700	1,350,700
us Tube Co.					3	1,800	1,800
el Corp.	10	660,000					660,000
int, Inc.,							
					3	25,000	25,000
nless Steel							
					3	32,000	32,000
Steel Co.	3	89,890					89,890
el Corporation	7	455,000					455,000
& Steel Corp.	5	234,000					234,000
a Co., A.					2	33,000	33,000
g Inc.					3	20,040	20,040
Company	10	1,370,200			17	278,000	1,648,200
Services							
tion	2	60,000			1	12,300	72,300
Steel Co.	13	720,000					720,000
Steel Corp.					2	198,000	198,000
Steel Corp.	3	100,750					100,750
Company	2	50,470			1	5,080	55,550
Steel							
o					1	16,920	16,920
Company	40	4,500,000					4,500,000
al Harvester							
	11	1,000,000					1,000,000
m Works					2	102,000	102,000
Company					4	33,490	33,490
ughlin Steel							
n	38	5,823,000	3	582,000	1	1,500	6,406,500
& Supply Co.					3	37,500	37,500
Corporation	3	76,500					76,500
Corp.	9	1,536,000					1,536,000
el & Wire Co.	4	400,000					400,000
Company					3	34,020	34,020
n Company					2	38,000	38,000
l Company	4	410,000					410,000
el Company					5	24,000	24,000
u, Inc., R. G.					3	138,600	138,600
l Company	12	675,000					675,000
el Corpora							
					4	579,700	579,700
ine Company	4	85,000			1	20,000	105,000
mpany	4	184,920			7	140,030	324,950
rge & Ord.							
pany					3	25,000	25,000
el Corp.							
a Steel Corp.	17	3,150,000	(c) 2				3,150,000
el Co.	13	2,500,000	(c) 2				2,500,000
	30	5,650,000	(c) 4				5,650,000

Steel Capacity (Ingots and Steel for Castings) January 1, 1953 (*Continued*)

	OPEN HEARTH		BESSEMER		ELECTRIC AND CRUCIBLE		Total annual capacity (N. T.)
	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	No.	Annual capacity (N. T.)	
Companies (*Continued*):							
National Supply Co.					3	50,200	50,200
(b) Newport News Shipbuilding & Dry Dock Co.					3	12,000	12,000
Newport Steel Corp.	7	375,300			3	333,200	708,500
Northwest Steel Rolling Mills, Inc.					2	42,000	42,000
Northwestern Steel & Wire Co.					5	825,000	825,000
Ohio River Steel Div., Louis Berkman Company	4	136,080					136,080
Oregon Steel Mills					3	110,000	110,000
Pacific States Steel Corp.	3	198,000			4	100,000	298,000
Pittsburgh Steel Co.	12	1,320,000					1,320,000
Republic Steel Corp.	78	8,222,000	2	665,000	26	1,375,000	10,262,000
Rotary Electric Steel Co.					5	425,000	425,000
(b) Seidelhuber Steel Rolling Mill Corp.					1	60,000	60,000
Sharon Steel Corp.	19	1,478,000			2	72,000	1,550,000
Simonds Saw & Steel Co.					3	21,600	21,600
(b) Southwest Steel Rolling Mills					1	45,000	45,000
Stanley Works	3	188,280					188,280
Texas Steel Company					2	32,320	32,320
Timken Roller Bearing Company					9	625,200	625,200
Union Electric Steel Corp.					2	26,760	26,760
United States Steel Corp.:							
United States Steel Corp. (Central Operations)	224	23,380,000	(d) 8	1,284,000	9	357,000	25,021,000
American Steel & Wire Div.	26	2,093,000					2,093,000
Columbia-Geneva Steel Div.	21	2,274,000			1	12,000	2,286,000
National Tube Div.	15	2,434,000	6	1,110,000			3,544,000
Tennessee Coal & Iron Div.	23	3,455,000	(c) 3				3,455,000
TOTAL	309	33,636,000	17	2,394,000	10	369,000	36,399,000
Universal-Cyclops Steel Corporation					5	70,160	70,160
Vanadium-Alloys Steel Co.					3	11,910	11,910
Colonial Steel Co.					2	29,820	29,820
TOTAL					5	41,730	41,730
Vulcan Crucible Steel Co.					2	9,600	9,600
Washburn Wire Co.	4	93,000					93,000
West Virginia Steel & Mfg. Co.					1	78,840	78,840
Wheeling Steel Corp.	11	1,440,000	2	420,000			1,860,000
Youngstown Sheet and Tube Company	39	4,707,500	2	240,000			4,947,500
GRAND TOTAL	971	102,677,980	(e) 33	4,637,000	(f) 278	10,232,490	117,547,470

Annual Coke Capacity as of January 1, 1953

	BEEHIVE		OTHER		*Total annual capacity (N. T.)
	No. of ovens	Annual capacity (N. T.)	No. of ovens	Annual capacity (N. T.)	
Companies:					
Alan Wood Steel Company	.....	.....	151	600,000	600,000
Armco Steel Corporation	.....	.....	110	558,000	558,000
Sheffield Steel Corporation	.....	.....	47	270,000	270,000
TOTAL	.....	.....	157	828,000	828,000
Bethlehem Steel Company	.....	.....	2,057	10,450,000	10,450,000
Colorado Fuel and Iron Corporation	.....	.....	266	1,220,000	1,220,000
Crucible Steel Company of America	.....	.....	213	831,600	831,600
Detroit Steel Corporation	.....	.....	108	550,000	550,000
Eastern Gas and Fuel Associates	.....	.....	204	1,112,000	1,112,000
Ford Motor Company	.....	.....	183	1,434,450	1,434,450
Granite City Steel Co.	.....	.....	49	295,000	295,000
Inland Steel Company	.....	.....	418	2,143,400	2,143,400
Interlake Iron Corporation	.....	.....	333	1,348,300	1,348,300
International Harvester Company	.....	.....	148	664,300	664,300
Jones & Laughlin Steel Corporation	240	192,000	812	3,769,200	3,961,200
Kaiser Steel Corporation	297	100,000	135	566,000	666,000
Kaiser & Frazer Parts Corporation	500	300,000	.....	.....	300,000
Lone Star Steel Company	.....	.....	78	438,000	438,000
National Steel Corporation:					
Great Lakes Steel Corporation	.....	.....	146	1,120,000	1,120,000
*Hanna Furnace Corporation	.....	.....	126	661,500	661,500
Weirton Coal Company	136	120,000	.....	.....	120,000
Weirton Steel Company	.....	.....	249	1,310,000	1,310,000
TOTAL	136	120,000	521	3,291,500	3,411,500
Pittsburgh Coke & Chemical Company	.....	.....	140	1,000,000	1,000,000
Pittsburgh Steel Company	574	426,000	74	500,000	926,000
Republic Steel Corporation	296	215,000	1,228	*6,681,500	*6,896,500
Sharon Steel Corporation	.....	.....	60	225,000	225,000
Carpentertown Coal & Coke Co.	585	375,000	.....	.....	375,000
TOTAL	585	375,000	60	225,000	600,000
Sloss-Sheffield Steel & Iron Division of United States Pipe & Foundry Co.	.....	.....	150	800,000	800,000
Tennessee Products & Chemical Corp.	.....	.....	44	251,500	251,500
United States Steel Corporation:					
United States Steel Corp. (Central Operations)	2,912	2,073,750	3,169	15,244,820	17,318,570
American Steel & Wire Division	.....	.....	394	1,318,270	1,318,270
Columbia-Geneva Steel Division	.....	.....	308	1,212,300	1,212,300
National Tube Division	.....	.....	385	1,766,750	1,766,750
Tennessee Coal & Iron Division	.....	.....	572	2,945,550	2,945,550
TOTAL	2,912	2,073,750	4,728	22,487,690	24,561,440
Wheeling Steel Corporation	.....	.....	314	1,720,000	1,720,000
Woodward Iron Company	.....	.....	256	938,000	938,000
Youngstown Sheet and Tube Company	.....	.....	655	3,234,000	3,234,000
GRAND TOTAL	5,540	3,801,750	13,482	67,379,440	71,181,190

* Includes 50% of coke capacity of the Donner-Hanna Coke Corporation, Buffalo, New York

Capacity of Blast Furnaces — January 1, 1953 (*Continued*)

	PIG IRON		FERROALLOYS		Total annual capacity (N. T.)
	No. of stacks	Annual capacity (N. T.)	No. of stacks	Annual capacity (N. T.)	
Ohio					
wn Sheet and Tube Company	4	1,450,800			1,450,800
Steel Corporation	1	235,000			235,000
Steel & Wire Division	2	530,000			530,000
Laughlin Steel Corporation	2	740,000			740,000
Steel Corporation	6	2,251,000			2,251,000
wn Sheet and Tube Company	1	200,400			200,400
n Company			1	100,000	100,000
on & Steel Company			1	93,000	93,000
Tube Division	5	1,842,500			1,842,500
el Corporation	1	148,620			148,620
ry					
Steel Corporation	1	136,800			136,800
Steel Corporation	1	338,000			338,000
el Corporation	3	564,000			564,000
el Corporation	1	164,700			164,700
Steel Corporation	5	1,444,500			1,444,500
n Coke & Chemical Company	1	182,500			182,500
ron Corporation	2	551,180			551,180
Steel Corporation	1	516,000			516,000
Steel Corporation	5	1,717,000			1,717,000
tes Steel Corp. (Central	6	2,003,700			2,003,700
wn Sheet and Tube Company	3	501,600			501,600
TOTAL	49	15,518,300	3	193,000	15,711,300
Pennsylvania					
ughlin Steel Corporation	5	1,800,000			1,800,000
Steel Company	7	2,428,000			2,428,000
Fuel and Iron Corporation	1	151,200			151,200

Capacity of Blast Furnaces — January 1, 1953 (*Continued*)

	PIG IRON		FERROALLOYS		Total annual capacity (N. T.)
	No. of stacks	Annual capacity (N. T.)	No. of stacks	Annual capacity (N. T.)	
Pennsylvania (*Continued*)					
Braddock					
United States Steel Corp. (Central Operations)	7	2,602,700	...	.....	2,602,700
Chester					
Chester Blast Furnace, Inc.	1	200,000	...	.....	200,000
Clairton					
United States Steel Corp. (Central Operations)	2	528,800	1	85,200	614,000
Donora					
American Steel & Wire Division	2	450,000	...	.....	450,000
Duquesne					
United States Steel Corp. (Central Operations)	5	1,346,300	1	105,300	1,451,600
Erie					
Interlake Iron Corporation	1	271,890	...	.....	271,890
Etna					
United States Steel Corp. (Central Operations)	...	.....	2	145,000	145,000
Farrell					
Sharon Steel Corporation	2	561,000	...	.....	561,000
Johnstown					
Bethlehem Steel Company	5	1,428,000	2	216,000	1,644,000
McKeesport					
National Tube Division	4	1,380,300	...	.....	1,380,300
Midland					
Crucible Steel Company of America	3	895,000	...	.....	895,000
Monessen					
Pittsburgh Steel Company	3	954,000	...	.....	954,000
Morrisville					
United States Steel Corp. (Central Operations)	3	1,134,000	...	.....	1,134,000
Neville Island					
Pittsburgh Coke & Chemical Company	2	654,000	...	.....	654,000
Palmerton					
New Jersey Zinc Company	...	.....	2	113,000	113,000
Pittsburgh					
Jones & Laughlin Steel Corporation	6	1,872,000	...	.....	1,872,000
Rankin					
United States Steel Corp. (Central Operations)	6	2,133,000	...	.....	2,133,000
Sharpsville					
Shenango Furnace Company	2	423,100	...	.....	423,100
Sheridan					
Lavino and Company, E. J.	...	.....	1	56,000	56,000
Steelton					
Bethlehem Steel Company	3	876,000	...	.....	876,000
Swedeland					
Alan Wood Steel Company	2	454,800	...	.....	454,800
TOTAL	71	22,443,990	9	719,400	23,163,390

Capacity of Blast Furnaces — January 1, 1953 (*Continued*)

	PIG IRON		FERROALLOYS		Total annual capacity (N. T.)
	No. of stacks	Annual capacity (N. T.)	No. of stacks	Annual capacity (N. T.)	
Tennessee					
Lyles-Wrigley					
Tennessee Products & Chemical Corp.	1	36,300	...	.....	36,300
Rockwood					
Tennessee Products & Chemical Corp.	2	181,440	...	.....	181,440
TOTAL	3	217,740	...	.....	217,740
Texas					
Houston					
Sheffield Steel Corporation	1	300,000	...	.....	300,000
Lone Star					
Lone Star Steel Company	1	385,000	...	.....	385,000
TOTAL	2	685,000	...	.....	685,000
Utah					
Geneva					
Columbia-Geneva Steel Division	3	1,200,000	...	.....	1,200,000
Ironton					
Columbia-Geneva Steel Division	2	482,700	...	.....	482,700
TOTAL	5	1,682,700	...	.....	1,682,700
Virginia					
Lynchburg					
Lavino and Company, E. J.	...	.....	1	56,000	56,000
West Virginia					
Benwood					
Wheeling Steel Corporation	1	234,000	...	.....	234,000
Weirton					
Weirton Steel Company	4	2,000,000	...	.....	2,000,000
TOTAL	5	2,234,000	...	.....	2,234,000

(a) Furnace included under pig iron.

The Iron Age

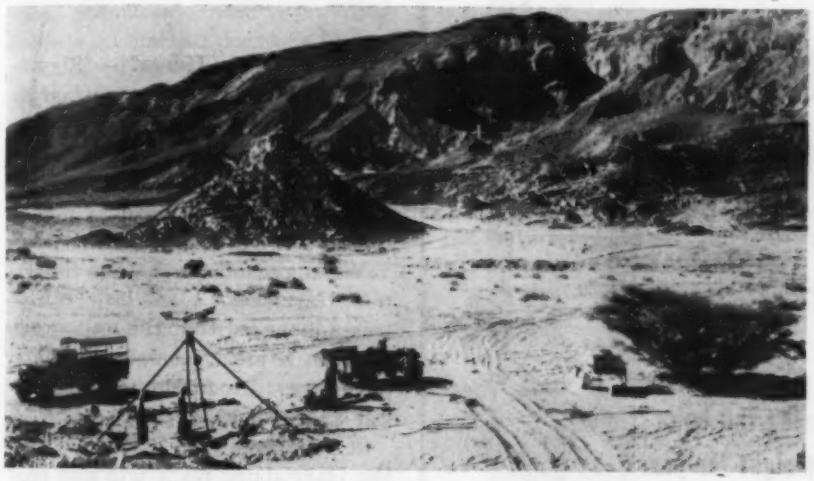
King Solomon's Mines

King Solomon would be surprised if he could see what's happening to his copper mines near Elath, Israel. A modern community is springing up in the forbidding terrain, and modern mining techniques are being applied to bring out the ore.

A cooperative effort between Israel Mining Industries, Ltd., and Société Belgo-Continental des Mines et Metaux, the development is about 15½ miles south of Elath, most southerly town in Israel, near the Gulf of Aqaba. The Belgian firm is supplying the overall planning and technological advice to mine the rich ore. Plans call for installation of a smelter on the spot to save transportation costs.

Climate is a major difficulty. Miners begin their workday at 5 a.m., must quit at 1 p.m. because of the heat. Some 300 workers are quartered at a nearby camp, where permanent housing is being erected.

Sentry stands guard near open-pit workings at copper mines near Elath. Galleries have been drilled in hill behind.



Mines are in rugged terrain. Left foreground is a shaft dug to follow copper ore vein. Winch and tripod lift mined ore, add it to the pile.

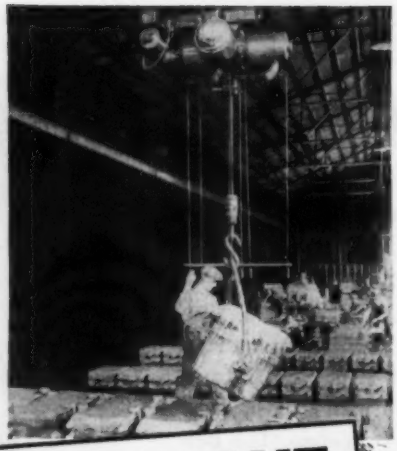
Work in this gallery has been suspended until ventilating equipment is installed.

Miner prepares explosive charge, fusing it to electric cable before detonation.

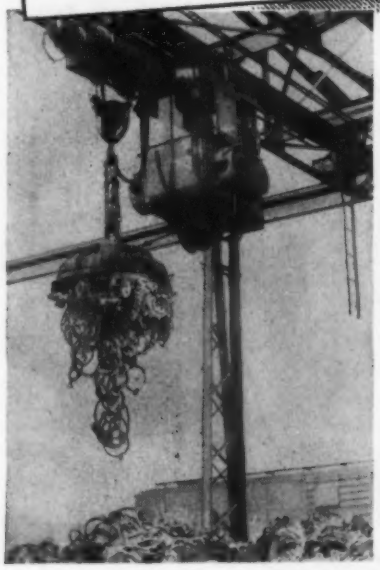
Pneumatic drills dig ore in open-pit operation. The ore, a greenish-colored stone is loaded into skips which are towed to the surface by winch.

SHEPARD NILES
Floor-Operated Hoist

Operator mainly occupied with other duties. Hoist used for fast, efficient handling of relatively short hauls.



WHICH HOIST is RIGHT FOR YOUR JOB?



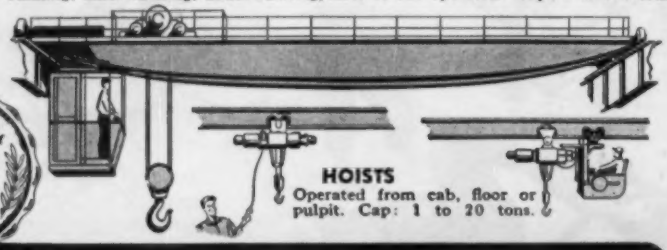
SHEPARD NILES
Cab-Operated Hoist

Operator in cab moves loads along at high speeds—occupies best vantage point for spotting or stacking materials.

Choosing the hoist that's right for your job calls for expert advice.

Let the Shepard Niles representative in your area guide you in your choice. He specializes in through-the-air handling—can help you select the hoist that best fits your job. Write Shepard Niles today for latest bulletins describing both types of hoists—and ask to have a representative stop by your office.

CRANES
Overhead: Top running, inner running, under running, floor or cab operated. Cap: 1 to 450 tons.



50th ANNIVERSARY
SHEPARD NILES CRANE & HOIST CORP. 1903-1953

HOISTS
Operated from cab, floor or pulpit. Cap: 1 to 20 tons.

SHEPARD NILES
CRANE AND HOIST CORPORATION

1424 SCHUYLER AVENUE, MONTOUR FALLS, N.Y.

—Production—

PRE-FABS: Gunnison

Won't expand West Albany, Ind., plant . . . But Harrisburg plant may make steel home.

Gunnison homes displayed the new Talisman model to 400 Gunnison dealers at Chicago last week. The latest addition to the Gunnison line, designed by San Francisco architect Henry Hill, was spacious, well studded with windows, pleasing to the eye.

The West Albany, Ind., plant of Gunnison, U. S. Steel subsidiary, has been operating at a brisk clip since the introduction of the low-priced Champion ($6,300 with lot) in September, 1949. The plant can produce 7500 homes per year, or 43 homes per day.

Push Steel Home? — Significantly, the West Albany plant is not due for expansion, despite a very favorable reception to the pre-fab mass produced wooden home. Gunnison seems to have its eye on its plant at Harrisburg, Pa.

When ground was broken for the new Harrisburg plant last year, it was announced that the unit would produce a steel insulated military structure. Production should begin June 15, 1953.

It is a positively safe bet that the Harrisburg plant will also produce a steel home. It is capable of producing 16,000 such homes per year. Gunnison put $6 million into this plant, has not expanded its New Albany plant despite good demand.

It is certain that in the near future, Gunnison dealers will be offering all-steel homes for sale and will push these even harder than the pre-fab wood home.

Virgin Territory—Gunnison is building up its sales force in the South and West. It reports its dealer concentrations in the Midwest and East are about at the optimum.

The West Coast is virtually untouched, chiefly because of costs incurred in shipping plywood and

Debuts New Model

lumber from the Northwest timber country to Indiana, then back again for sale. The present potential sales area still lies east of the Rockies.

Gunnison wood homes will retail at from $6,000 to $12,500 without lot, are being marketed chiefly by established contractors and by realtors.

Plans are underway already to incorporate steel structural members in parts of the wood house. Use of steel should push costs down a little further.

Enough Diamond Powder—If . . .

Supply of diamond grinding wheels is likely to be sufficient to meet industrial needs provided there is no marked decrease in imports of diamond crushing bort and conservation measures are continued.

This is the analysis of government officials and manufacturers of diamond grinding wheels who met recently to discuss the situation. It was agreed that demand is in "very delicate" balance with supply.

Following an import shortage in 1951, shipments of foreign diamond bort and powder have steadily increased. At the beginning of this year most users had a 60-day inventory of diamond grinding wheels.

"When it's time for your wife to go to the hospital—okay, but stop these trial runs."

TRANSFERS - SCALE CARS
COAL CHARGERS - COKE QUENCHERS

FOR THE VERY BEST
See ATLAS

COKE QUENCHING CAR

The latest Atlas Quenching Cars have longer life with lower maintenance than previous types. Their cost also is lower. This is due to the welded "corrosion-resisting" frame of heavier material with fewer joints and all joints weld-sealed together with the use of abrasion resisting floor plates which outwear cast plates and cost less to replace. There is no welding on Atlas abrasion resisting floor plates. An improved door operating mechanism is sealed against the entrance of coke dust and water and is simplified to eliminate the troublesome line shafts. Coke deflectors are provided at each end. Air hoses are armorclad. Gates generally are of steel bars arranged for easy replacement. Cars are supplied with or without upper coke racks.

ENGINEERS AND MANUFACTURERS
THE ATLAS CAR & MFG. CO.
1100 IVANHOE ROAD • CLEVELAND 10, OHIO

AUTOMATION: Pressure on Upkeep

Increased mechanization of the automatic factory will make maintenance a top management problem . . . Streamlined methods outlined at Cleveland . . . How to cut costs—By *R. M. Lorz.*

With some industries already automated, and with the prospect that the automatic factory will invade almost every field of production within the next 10 years, maintenance is no longer a left-handed operation.

That's what some of the more than 15,000 industry executives and visitors attending the annual plant maintenance show in Cleveland's Public Auditorium were told last week.

More than 300 companies exhibited around 7000 products, ranging from hand driers to chemical descaling units. Many of the exhibitors reported sales double last year's volume, and heavy machinery representatives said they received a much larger number of inquiries than at the last show.

Maintenance Costs More — Although increased mechanization will boost productivity and raise living standards, manufacturers were warned that both management and labor would have to prepare for higher maintenance costs. In addition to finding new capital for streamlined machinery, management was told it would also have to consider unit costs instead of treating maintenance as a segment of general overhead.

Labor will have to move with the change, because automation will introduce complicated maintenance problems along with simplified production techniques.

Spiraling cost of mechanization was graphically pointed out by one conference speaker who stated that average machinery investment per worker in 1951 was $8000. Average in 1900 was only $2000 per worker.

Plans for New Era—Assignment of technical consultants and engineers to maintenance departments and renewed emphasis on training programs for maintenance personnel were stressed as musts in planning for the new automatic plant era. Installation of up-to-date communications equipment was also urged as a way to increase plant efficiency.

Panel discussions on cost control were aimed at reducing maintenance expenditures which now consume from 8 to 15 pct of each sales dollar.

How to Cut Costs—Most practical suggestions for cutting costs were based on the assumption that maintenance had to be given special consideration. Speakers recommended that maintenance departments be treated as separate units instead of as stepsisters of manufacturing departments.

The spokesman believed that if manufacturers realized the importance of maintenance, they would abandon many of their current inefficient practices. They would stop assigning second hand tools to maintenance departments and would work out better methods of transporting tools to job sites. In addition, definite maintenance work schedules would be set up and maintenance units would be located as centrally as possible.

"Safest worker in the shop."

Estimating Costs—A dollar-for-dollar approach to cost estimating was also outlined as a possible money saver for larger firms. Under this system qualified personnel would work with foremen in estimating cost by departments.

These cost "accountants" would determine effectiveness of preventive maintenance by estimating productive hours and cost of maintenance. Type and age of equipment, possibility of replacement, and other aspects should be considered to make this estimate realistic. If estimates are correct, final figures should show a dollar recovered for each dollar spent on maintenance.

Standardize Parts—Paul Walter, superintendent of Repuolic Steel Corp.'s mechanical department, told steel producers they should try to make the types of materials used for maintenance more uniform. Mr. Walter said standardization of fits, tapers, finishes, bolts, and screw threads gave his firm greater interchangeability of parts and simplified field problems.

Foundrymen, who are taking giant strides in mechanization, were warned that more machinery would mean more breakdowns and increased downtime which could be particularly damaging because of the high labor rates in their industry.

A talk by Tell Berna of National Machine Tool Builders' Assn. highlighted the 4-day show which was open from Jan. 19 through Jan. 22. Mr. Berna told those attending that the inflationary trend in this country could be licked by greater productivity.

Interest Mounts—An indication that industry is becoming more maintenance conscious is the increased attendance at the annual plant maintenance shows. Last year's show, held in Philadelphia, attracted about 11,700 people, while this year's turnout topped the 15,000 mark.

COMMERCIAL VEHICLES:

Ceilings may be refigured on f.o.b. basis . . . Must be approved by OPS.

Builders of commercial motor vehicles are getting the opportunity to recompute ceiling prices, which may mean recovery of the higher freight costs paid on shipment of unassembled components from factories to assembly plants.

On or before Feb. 23, manufacturers may put into effect the price-determining methods outlined in Supplementary Reg. 11, Ceiling Price Reg. 30. This SR, issued Jan. 23, does not demand recalculation of ceilings but makes it optional with manufacturers of automotive trucks, motor coaches, truck trailers, ambulances, hearses, flower cars, motorcycles, and motor scooters.

Figure on F.O.B. Basis—Using SR 11, the manufacturer may recompute the ceiling price for his vehicles and any extra, special, or optional equipment they carry, so as to put his prices on an f.o.b. factory basis. He then may add separately his freight charges, federal excise taxes, equipment charges, and special fees, following the method he used on Dec. 1, 1950.

In establishing a ceiling for a new product under SR 11, the manufacturer will apply to the unit cost of the vehicle the percentage margin over the current cost recorded on the nearest comparable product for which he has figured a ceiling. Approval of the new ceiling must come from Office of Price Stabilization.

SR 11 incorporates many of the provisions of Ceiling Price Reg. 1, Rev. 1, the order governing passenger car manufacturers.

Industry Controls This Week

Autos — SR 11, CPR 30 permits builders of commercial motor vehicles to recompute ceiling prices to cover increased freight costs.

Aluminum — Amend. 1, SR 113, GCPR and Amend. 8 GOR 35 authorized increases of ½¢ per lb on primary and alloy aluminum pig and 4 pct on primary aluminum products and permit pass-through of these price hikes to customers. After January filing, independent fabricators and secondary aluminum smelters will not have to file NPAF-167. Primary producers are still required to make this report.

Alloy Steel — SR 4, CPR 60 grants alloy steel castings producers a 3½ pct ceiling price increase.

Ceramics—NPA has revoked percentage limitations on defense orders which producers of certain steatite electrical ceramic products were formerly required to accept.

Fuel, Oil—Amend. 9, CPR 17 defines the extent to which increased transportation costs may be passed through on prices of gasolines, naphthas, fuel oils and liquefied petroleum gases. Amend. 2, CPR 63 permits producers, distributors and jobbers of lubricating oils, greases, waxes and other petroleum products to raise prices to cover increased transportation costs.

Machinery — Metalworking machines priced at less than $1000 have been added to sched. 1, CMP Reg. 5. This means MRO ratings can no longer be used to obtain delivery of such items.

Magnesite—SR 132, GCPR authorizes a 9 pct ceiling price hike for producers of dead burned magnesite used in the manufacture of brick and other refractory products.

Pricing—Amend. 7, GOR 35 allows manufacturers who use steel, pig iron, copper and aluminum as a manufacturing material to pass through the increased cost of these products, regardless of source of supply. Amend. 39, GCPR was issued to reduce inequities in establishing markups on new commodities at the wholesale and retail levels.

Scrap—Amend. 12, CPR 5 clarifies the definition of iron and steel scrap brokers and changes the basis on which deductions are made from the shipping point ceiling price for scrap sales in which the buyer must transfer the scrap from the seller's premises.

STEEL: Finished Shipments Slip in November

As Reported to the American Iron and Steel Institute

STEEL PRODUCTS	CURRENT MONTH					TO DATE THIS YEAR				
	Carbon	Alloy	Stainless	Total	Pct of Total Shipments	Carbon	Alloy	Stainless	Total	Pct of Total Shipments
Ingots	106,932	20,079	2,605	129,616	2.0	*731,968	234,726	18,484	*985,178	1.6
Blooms, slabs, billets, tube rounds, sheet bars, etc.	165,802	53,566	1,604	220,772	3.3	1,551,708	480,950	16,599	2,049,257	3.4
Skelp	9,255	.....	.....	9,255	0.1	94,408	.....	.....	94,408	0.1
Wire rods	73,050	2,240	676	75,966	1.1	637,300	15,237	5,812	658,149	1.1
Structural shapes	404,392	11,860	3	416,255	6.3	3,645,567	70,813	76	3,716,456	6.1
Steel piling	17,419	.....	.....	17,419	0.3	197,716	.....	.....	197,716	0.3
Plates	640,008	38,251	2,807	679,066	10.2	5,940,005	322,551	24,542	6,287,098	10.3
Rails—standard	140,216	3	.....	140,219	2.1	1,204,445	167	.....	1,204,612	2.0
Rails—all other	5,223	1	.....	5,224	0.1	96,721	61	.....	96,782	0.2
Joint bars	8,886	.....	.....	8,886	0.1	99,658	.....	.....	99,658	0.2
Tie plates	34,349	.....	.....	34,349	0.5	338,911	.....	.....	338,911	0.6
Track spikes	8,282	.....	.....	8,282	0.1	89,408	.....	.....	89,408	0.1
Wheels	25,974	139	.....	26,113	0.4	299,570	909	.....	300,479	0.5
Axles	15,478	39	.....	15,517	0.2	146,631	213	.....	146,844	0.2
Bars—hot rolled	604,380	219,226	4,669	828,275	12.5	5,400,858	1,802,363	43,190	7,246,442	11.9
Bars—reinforcing	153,110	.....	.....	153,110	2.3	1,601,940	.....	.....	1,601,940	2.6
Bars—cold finished	146,235	29,956	5,161	181,352	2.7	1,382,537	294,708	45,310	1,722,555	2.8
Tool steel	1,371	7,498	.....	8,869	0.1	18,420	92,595	.....	111,015	0.2
Standard pipe	244,425	4	.....	244,429	3.7	2,177,203	275	12	2,177,490	3.6
Oil country goods	143,355	15,902	.....	159,157	2.4	1,305,357	135,952	.....	1,441,309	2.4
Line pipe	253,226	.....	.....	253,226	3.8	2,581,370	172	.....	2,581,542	4.2
Mechanical tubing	63,723	23,474	595	87,792	1.3	803,419	239,673	6,184	849,276	1.4
Pressure tubing	33,875	2,853	1,513	38,241	0.6	327,726	34,828	11,663	374,017	0.6
Wire—drawn	253,159	5,439	3,499	262,097	3.9	2,281,655	50,992	27,443	2,360,090	3.9
Wire—nails, staples	56,716	.....	2	56,718	0.9	602,943	.....	22	602,965	1.0
Wire—barbed, twisted	23,207	.....	.....	23,207	0.4	220,864	.....	.....	220,864	0.4
Wire—woven fence	22,969	.....	.....	22,969	0.4	309,291	.....	.....	309,291	0.5
Wire—bale ties	1,534	.....	.....	1,534	....	58,459	.....	.....	58,459	0.1
Black plate	77,869	.....	.....	77,869	1.2	802,660	.....	.....	802,660	1.3
Tin & terneplate—hot dipped	123,264	.....	.....	123,264	1.9	1,235,069	.....	.....	1,235,069	2.0
Tin plate—electrolytic	265,086	.....	.....	265,086	4.0	2,575,489	.....	.....	2,575,489	4.2
Sheets—hot rolled	587,501	23,316	1,871	612,688	9.2	5,219,513	215,831	23,053	5,458,397	9.0
Sheets—cold rolled	787,888	11,832	10,830	810,330	12.2	6,941,463	79,064	95,796	7,116,323	11.7
Sheets—galvanized	194,619	93	.....	194,712	2.9	1,752,874	93	.....	1,752,967	2.9
Sheets—other coated	18,593	.....	.....	18,593	0.3	*186,050	.....	.....	*186,050	0.3
Sheets—enameling	14,588	.....	.....	14,588	0.2	*133,337	.....	.....	*133,337	0.2
Electrical sheets, strip	8,634	53,993	.....	62,627	0.9	77,549	463,995	.....	541,544	0.9
Strip—hot rolled	187,317	6,298	454	194,069	2.9	1,602,847	35,491	3,245	1,641,583	2.7
Strip—cold rolled	147,211	1,895	16,778	165,884	2.5	1 388,456	18,821	128,163	1,535,240	2.5
TOTAL	6,068,801	525,857	83,067	6,647,725	100.0	*55,859,336	4,890,110	449,394	*60,898,840	100.0

During 1951 the companies included above represented 98.5 pct of the total output of finished rolled steel products as reported to the American Iron and Steel Institute.
* Revised.

Defense Contracts

Government Inviting Bids

Latest proposed Federal procurements, listed by item, quantity, invitation No. or proposal and opening date. (Invitations for Bid numbers are followed by "B," requests for proposals or quotations by "Q.")

Ordnance Ammunition Center, Joliet, Ill.

Detonator M17, 15000000 ea, ORD-11-173-53-53B, Feb. 13.
Support proj. for container ammo metal, 153000 ea, ORD-11-173-53-42B, Feb. 10.
Support assy metal fiber container, M80A2, 796000 ea, ORD-11-173-53-42B, Feb. 10.

Corps of Engineers, Philadelphia.

Extinguisher, fire, foam type, copper, 20079 ea, ENG-36-109-53-449-JD, B, Feb. 6.
Telescoping, aluminum, 12459 ea, ENG-36-109-53-452-JD, B, Feb. 6.
Generator set, winterized, 180 ea, ENG-36-109-53-450-JD, B, Jan. 23.
Reflector, lamp, aluminum, 58166 ea, ENG-36-109-53-451-JD, B, Feb. 6.
Reflector, lamp, metal, enameled, 234786 ea, ENG-36-109-53-451-JD, B, Feb. 6.

Naval Shipyard, Portsmouth, N. H.

Cap, brass, 72000 ea, PR-330/53Q, Feb. 12.

Navy Purchasing Office, Washington.

Starters, 114, 6821A-B, Feb. 3.
Irons, electric soldering, 6864, 6875B, Feb. 3.

Bureau of Ships, Washington.

Coolers, engine jacket, 342, 551-232Q, Feb. 3.

Ordnance Tank Automotive Center, Detroit.

Stud wheel hub, 40000, 53-906B, Feb. 10.
Bearing, 1400, 53-906B, Feb. 10.
Shaft, flexibile assy, 10000, 53-974B, Feb. 10.
Speedometer assy, 40000, 53-968B, Feb. 10.
Lining set w/rivets, 20000, 53-954B, Feb. 10.
Rod tie steering, 3000, 53-906B, Feb. 10.
Cylinder rear wheel assy, 6000, 53-978B, Feb. 20.
Shield front axle brake hose, 900, 53-978B, Feb. 20.
Clip closed brake line, 25000, 53-978B, Feb. 20.
Cup air brake wheel cylinder, 1200, 53-978B, Feb. 20.
Gear, 1050, 53-979B, Feb. 12.
Pinion, gear box, 550, 53-979B, Feb. 12.
Pinion driven gear box, 350, 53-979B, Feb. 12.
Gear, 1050, 53-979B, Feb. 12.
Bearing set connecting, 13000, 53-801B, Feb. 12.
Bearing set connecting, 19000, 53-799B, Feb. 13.
Bearing set crankshaft, 1300, 53-271B, Feb. 12.
Arm assy, B269019, 500, 53-797OB, Feb. 13.
Gage, fuel, 26000, 53-1002B, Feb. 13.
Gage, instrument cluster, 26000, 53-1002B, Feb. 13.
Mechanism, 400, 53-837B, Feb. 13.
Mechanism, 324, 53-837B, Feb. 13.

Contracts Reported Last Week

Including description, quantity, dollar values, contractor and address. Italics indicate small business representatives.

Spare parts, $100,447, John Reiner & Co., Long Island City, N. Y.

Spare parts, lot, $53,183, Continental Elec. Co., Newark.

Spare parts for water lot purification unit, lot, $35,178, Wallace & Tierman Co., Belleville, N. J.

Spare parts, lot, $43,090, General Electric Co., Philadelphia.

Generator set, 450, $1,754,370, Hobart Bro. Co., Troy, Ohio.

Spare parts, lot, $31,051, General Motors Corp., Detroit, *R. C. Campbell.*

Retainers, spacers, rings, etc., 2028 ea, $38,945, Hardie-Tynes Mfg. Co., Birmingham, Ala.

Pump assy, 125 ea, $32,875, Vickers, Inc., Detroit, *R. M. McCabe.*

Plating control panels, 4 ea, $35,300, Hanson Van Winkle Munning Co., Matawan, N. J.

Regulator assy, 122 ea, $88,284, United Aircraft Corp., East Hartford, Conn., *E. E. Champion.*

Parts, var, $239,682, United Aircraft Corp., East Hartford, Conn., *E. E. Champion.*

Assy for use on P & W aircraft engines, var, $168,000, United Aircraft Corp., East Hartford, Conn., *E. E. Champion.*

Spare parts, var, $43,618, United Aircraft Corp., East Hartford, Conn., *E. E. Champion.*

Assy, var, $32,752, United Aircraft Corp., East Hartford, Conn., *Adam C. Wolz.*

Spare parts, var, $77,180, United Aircraft Corp., East Hartford, Conn., *Adam C. Wolz.*

Parts, var, $121,589, United Aircraft Corp., East Hartford, Conn., *E. E. Champion.*

Maintenance parts, var, $6,211,891, United Aircraft Corp., East Hartford, Conn., *Adam C. Wolz.*

Wrenches, var, $52,437, Richmont, Inc., San Gabriel, Calif.

Bearings, 6296 ea, $76,370, United Aircraft Corp., East Hartford, Conn., *E. E. Champion.*

Filter & restrictor assys, var, $39,220, Purolator Prod., Inc., Rahway, N. J.

Transmitter, flap position, var, General Electric, Philadelphia.

Maintenance parts, var, $163,506, Bendix Aviation Corp., South Bend, Ind., *G. I. Lyman.*

Bearing, 18500 ea, $37,555, Sperry Gyroscope Co., Great Neck, N. Y., *George A. Dennis.*

Motor & brake assy, var, $25,763, Airborne Accessories, Hillside, N. J.

Wheel assy, 991 ea, $154,444, Goodyear Tire & Rubber Co., Akron.

Spare parts for aircraft, var, $2,709,000, General Electric Co., Philadelphia.

Maintenance spare parts for jet engines, var, $129,339, United Aircraft Corp., East Hartford, Conn., *E. E. Champion.*

Maintenance parts, var, $79,793, United Aircraft Corp., Dallas, *William H. Haugh.*

Assy var, $42,613, United Aircraft Corp., East Hartford, Conn., *E. E. Champion.*

Spare parts, var, $174,258, United Aircraft Corp., East Hartford, Conn., *E. E. Champion.*

Spare parts, var, $47,623, United Aircraft Corp., East Hartford, Conn., *E. E. Champion.*

Spare parts, var, $221,179, Caterpillar Tractor Co., Peoria, Ill.

Spare parts, var, $55,221, Daybrook Hydraulic Co., Bowling Green, Ohio.

Construction

New Construction Hits Peak High

Spending for new construction reached a record $32.3 billion in 1952, preliminary estimate by Bureau of Labor Statistics shows. But despite this all-time high dollar outlay, physical volume was still slightly below 1950 and 1951 levels. Increased construction costs were responsible for last year's higher expenditures.

Private construction accounted for $21.8 billion of the total building volume. The remaining $10.5 billion was spent for public works construction.

Steel Inquiries and Awards

Fabricated steel awards this week include the following:

18,000 Tons, Madison, Ind., Clisty Creek power plant for Indiana-Kentucky Electric Corp., a subsidiary of Ohio Valley Electric Corp., to Mississippi Valley Structural Steel Co., St. Louis, for deliveries beginning in Jan. 1954.

500 Tons, Denver Board of Water Commissioners, to Thompson Pipe & Steel Co.

Fabricated steel inquiries this week include the following:

349 Tons, Readsboro, Vt., 3 span continuous deck plate girder bridge with approaches. W. H. Morse Construction & Lumber Co., Inc., Bennington, Vt., low bidder.

200 Tons, Madison, Wis., Truax Field, readiness hangar and shops.

Reinforcing Bar Awards this week include the following:

4000 Tons, Chicago, underground parking garage, to Joseph T. Ryerson & Son.

875 Tons, Chicago, Wacker Drive Extension, to Joseph T. Ryerson & Son.

385 Tons, Chicago, Halsted St. cloverleaf, to Joseph T. Ryerson.

Fabricated steel inquiries this week include the following:

6000 Tons, Yankton, S. D., powerhouse, bids due Jan. 30.

3900 Tons, Riverdale, N. D., powerhouse, bids due Feb. 24.

190 Tons, Bourne, Sandwich and Barnstable, Mass., bituminous concrete pavement and 4 reinforced concrete rigid frame bridges. Lewis R. Sellew, Middleboro, district engineer. Completion date Dec. 31, 1953.

Fabricated Steel Shipments

November shipments of fabricated structural steel, as compiled from reports received by the American Institute of Steel Construction, amounted to 222,594 tons, a drop of 15% from the previous month, but slightly higher than the corresponding month of last year. Total shipments for the first eleven months of 1952 amounted to 2,436,953 tons.

Estimated Total Tonnage for the entire industry

CONTRACTS CLOSED	1952	1951	Avg. 1947-1950
Total Tonnage			
January	213,110	361,373	161,976
February	230,832	256,746	152,186
March	226,394	297,517	221,287
April	209,106	337,026	177,825
May	209,888	268,166	176,266
June	167,492	207,966	196,725
July	221,559	222,540	229,334
August	252,849	212,730	212,899
September	207,695	188,187	215,870
October	185,002*	183,921	223,280
November	143,454	192,065	194,380
Totals	2,267,381	2,728,237	2,162,128
SHIPMENTS			
January	244,947	214,000	166,910
February	246,398	193,638	161,170
March	268,840	237,087	191,297
April	230,670	234,095	192,861
May	244,222	234,486	198,436
June	125,486	257,066	192,851
July	138,267	204,380	183,329
August	226,277	236,915	204,948
September	227,595	228,296	197,331
October	261,657*	240,056	185,785
November	222,594	219,564	182,249
Totals	2,436,953	2,499,583	2,057,157
TONNAGE OF BACKLOG	2,357,351	2,437,668	1,407,149
Percentage scheduled for production within the next four months (To March 31)	44%	45%	52%
Percentage scheduled for production after the next four months (From April 1)	56%	55%	48%

* Revised

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ALSIMAG CUT-OFF CORES
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Industrial Briefs

Drills Did It—WALKER-TURNER DIV., Kearney & Trecker Corp., held an all day open house recently to show off its newly expanded plant to employees, suppliers and neighbors in Plainfield, N. J.

Fellowship — ASSN. OF IRON & STEEL ENGINEERS, Pittsburgh, is establishing a Fellowship for graduate study and research at the Carnegie Institute of Technology. Purpose is to select and train outstanding men for engineering in the iron and steel industry.

Skyward Bound — AMERICAN BRIDGE DIV., U. S. Steel Corp., has been awarded a contract for the 41-story Prudential Building at Chicago. Approximately 31,000 tons of steel will go into the new skyscraper. It will offer escalator service from the train level up to the seventh floor.

Automotive Distributor—WARNER ELECTRIC BRAKE & CLUTCH CO., Beloit, Wis., has appointed Charles W. Carter Co., Los Angeles, West Coast distributor for its Automotive Div.

Hear Ye! — GISHOLT MACHINE CO., Madison, Wis., has moved its Chicago sales representatives' office to 6920 W. North Ave.

Purchased — THE BAKER-RAULANG CO., Cleveland, has purchased Lull Mfg. Corp., Minneapolis.

New Chairman—ASSN. OF STEEL DISTRIBUTORS. INC., has elected Paul Goodwin, Eastern Steel & Metal Co., New Haven, Conn., as Chairman of the Eastern Region.

Going Up—A. O. SMITH CORP., Milwaukee, has begun construction of a new, ultra-modern electrode plant in Lancaster, Pa.

New Arm—THE FOXBORO CO., Foxboro, Mass., has opened a new branch office at Wichita, Kan. at 2207 S. Pinecrest. Dale G. Hugley has been appointed resident engineer.

Latest Step—CHIKSAN CO., Brea, Calif., has started expansion of its plant to increase office area, warehouse and assembly facilities. A large, modern building will be constructed adjacent to the present building.

Still Growing—ARTHUR D. LITTLE, INC., Cambridge, Mass., will erect new ultra-modern research facilities on the Concord Turnpike in West Cambridge. The new building will be adjacent to one recently completed for the Mechanical Div.

In Training—BECKMAN INSTRUMENTS, INC., has started a 3-month training program for 21 new sales engineers to carry their newest instrumentation techniques to manufacturers, research activities and processing industries throughout the United States.

Factory Site—REULAND ELECTRIC CO., Alhambra, Calif., has purchased a 12-acre factory site between Detroit and Lansing. Construction will start early this spring.

Hot Stuff—Tubular Products Div., THE BABCOCK & WILCOX TUBE CO., Beaver Falls, Pa., recently had a rotary hearth bloom heating furnace installed by George J. Hagen Co., Pittsburgh, in the Steel Mill.

Four In One—ALLIS-CHALMERS MFG. CO., has named Roche & Hull, Inc., Baltimore, a distributor in portions of Delaware, Maryland, Virginia, and West Virginia.

New Moniker — THE ROUND BRIDGEPORT CHAIN & MFG. CO., Bridgeport, is the new name of The Bridgeport Chain & Mfg. Co.

Gets Contract—PRESSED STEEL CAR CO., INC., has been awarded a contract by the Chicago Ordnance District of the Army calling for the operation and management of the large Rockford, Ill., Ordnance Plant.

Testing — SOUTHWESTERN ENGINEERING CO., Los Angeles, and Defense Materials Procurement Agency recently negotiated a contract for the analysis and testing of a series of metallurgical samples in the Los Angeles laboratories.

New Lab — F. J. STOKES MACHINE CO., Philadelphia, has opened a new laboratory providing complete facilities for testing and developing materials, equipment and processes for customers. The new facilities occupy about 2800 sq ft of floor space and represent an investment of more than $150,000.

Production Steel's Newest Modern ROLL and CUT LINE

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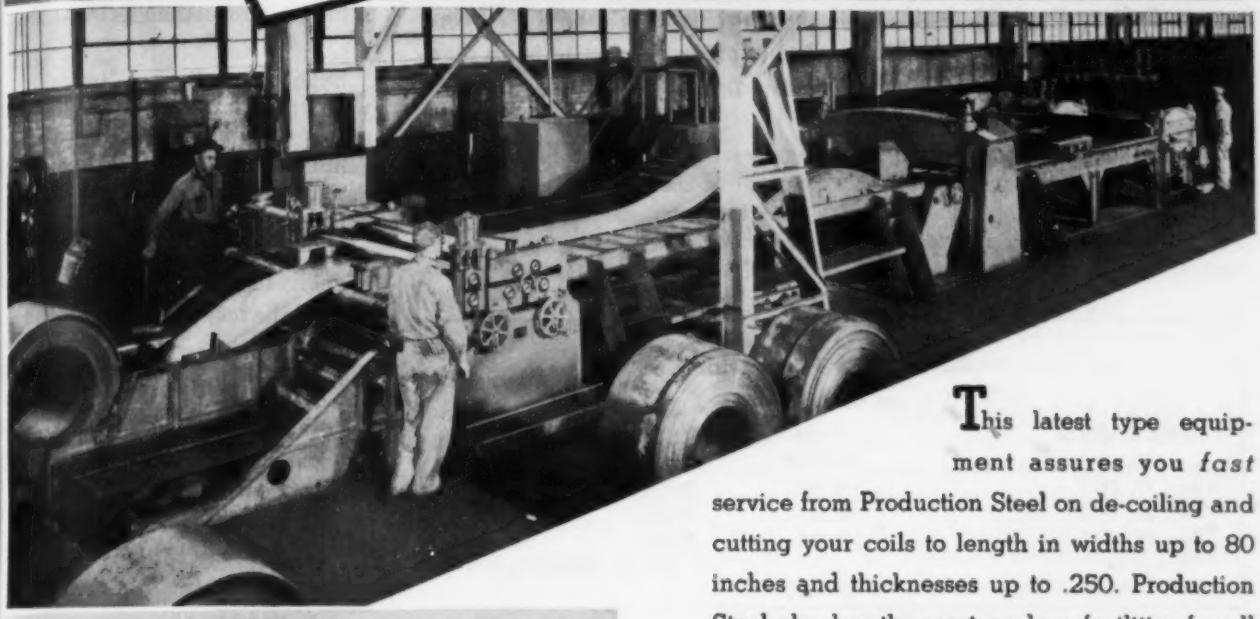

This latest type equipment assures you *fast* service from Production Steel on de-coiling and cutting your coils to length in widths up to 80 inches and thicknesses up to .250. Production Steel also has the most modern facilities for all types of processing . . . pickling, roller leveling, annealing, shearing, slitting and skin rolling.

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Phone: MAnsfield 6-4242

SENECA STEEL SERVICE, INC.
1050 Military Rd., Buffalo 17, N. Y.
Phone: Riverside 7920

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Phone: Broadway 3468
E. W. Richardson, Sales Representative

PRODUCTION STEEL COMPANY
548 W. Mechanic Street, Jackson, Mich.
Phone: 2-9097
Glenn Christman, Sales Representative

PRODUCTION STEEL CO. OF ILLINOIS
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Phone: WOodruff 2-1206
H. Clive Morrison, Sales Representative

SENECA STEEL SERVICE, INC.
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Phone: Culver 7480
W. J. Knoll, Sales Representative

SENECA STEEL SERVICE, INC.
1347 Northcliffe Rd., Syracuse, N. Y.
Phone: 73-5722
Dean Hethington, Sales Representative

SENECA STEEL SERVICE, INC.
347 Price Street, Jamestown, N. Y.
Phone: 5759
S. N. Olmsted, Jr., Sales Representative

PRODUCTION STEEL COMPANY
1040 High View Lane, Green Bay, Wisc.
Phone: Howard 7407
Tony Canadeo, Sales Representative

New Styling Is Studebaker Hole Card

Bets radical '53 design will take pot like '46 model . . . New styling always a gamble . . . But is often needed to keep independent in game . . . Stresses low lines—By *R. D. Raddant.*

Studebaker people have been inclined to look back on 1946 with nostalgia as probably the high point in the company's 100-year history as a wagon and auto producer. change adopted by this most successful of the independents emphasizes the problems faced by Studebaker and others competing against the Big Three.

Automotive Production

(U. S. and Canada Combined)

WEEK ENDING	CARS	TRUCKS	TOTAL
Jan. 24, 1953	120,235*	29,236*	149,471*
Jan. 17, 1953	118,110	29,939	148,049
Jan. 27, 1952	66,829	27,893	94,722
Jan. 19, 1952	70,708	27,961	98,669

*Estimated

Source: *Ward's Reports*

In case it needs pointing out, that year Studebaker produced the first really new postwar car with a styling change that set the pace in the industry.

But this year they think they have something in the 1953 model that will obscure that year and again focus attention on South Bend.

Quoting the company's own handout, "Studebaker's 1953 cars break as sharply with American contemporary design as did their predecessors after the war." With allowances for partisanship, this is very nearly a fair statement.

Sits Low — Striking feature about the new car is its height, or rather lack of it. The hardtop is only 56 5/16 in. in overall height and the sedan about 4 in. higher. It has what might be called a concave design with front and rear curving downward giving the car an unusually low profile. Glass area has been increased as much as 819 sq in. in one model, about 33 pct more than its 1952 counterpart.

While the car is interesting enough in itself, the radical styling

Sales Small—Studebaker, for example, turned out about 160,000 cars in 1952 and Nash slightly less. This puts them under Mercury, with 189,000, the Big Three car closest in point of sales. In the trlumvirate, only De Soto, Chrysler, Cadillac and Lincoln, all in the higher price bracket, had smaller sales.

To compete against the resources of the bigger corporations, the independent must come up with something different if it is going to stay in the black. Studebaker's new styling may be considered a gamble, as was the 1946 model, but it was necessary.

Independent Troubles—Independents are at a big disadvantage in many respects, most of which come back to cost. Larger corporations have vast engineering, styling and research sections which serve the entire line of cars, not just one. Purchasing and marketing resources give them a tremendous advantage, particularly in time of shortage.

Studebaker spent probably $27 million in tooling up for their new car. Bigger divisions have gon over $100 million. To Studebake its $27 million probably represente a bigger proportionate investment

Save Your Tears—However, i would be a waste of time to devot too much sympathy to the indepen dents. They are doing well, wit probably one exception, and th advantage of being independent ex tends to the auto industry as well a to individuals.

When he took over as president o Packard, James J. Nance observe that there are independents i every industry. He acknowledge the disadvantages and problem they face, but pointed out that aler management and sound manufac turing can surmount these ob stacles. The thriving automotive independents prove this point clearly.

The Cheap Way—Detroit Tan Arsenal has come up with an ide for reconditioning and retread ing tank roadwheels and track that can save American taxpayer $6 million a year.

Life expectancy of new road wheels and tracks is only about 2500 miles. Up to now the use equipment was discarded becaus the wheels became so worn an warped that they could not be re surfaced with rubber. Nor wer molds available that were flexible enough to absorb the irregularitie of used wheels.

How It's Done — To process used wheel, the wheel is first re conditioned and a new tire put on Then it is pressed in a new mol made of rolled steel rather than castings. The rolled steel is flexible enough to absorb irregularities Worn guide flanges are repaired with a special welding process by which they are built up by dropping molten metal on the prepared wheel surface, then machined to size.

A pilot plant is now in operation in Detroit and others will be put

...to use in other parts of the country. Each wheel salvaged means an immediate saving of $40. At World War II rates, the new procedures could save $27 million in one year and more than 28,000 tons of steel.

...ruckers Polite, Cabbies Rude

Surveys by Automobile Manufacturers Assn. are known for their reliability as well as their informative nature. But here's one that raises a skeptical eyebrow.

In a recent survey to measure public knowledge and attitudes regarding truckers, one of the findings was that motorists consider trucks among "the least of possible annoyances to be encountered in either country or city driving."

Principal conclusion was that truck drivers were picked by the greatest number of those questioned as the most courteous drivers on the open road. Private motorists trailed far behind in both safety and courtesy. It should be no surprise that taxi drivers held down last place in both categories. But then cabbies operate mainly in cities and towns.

Ford Service Gets Status Boost

Ford Motor Co. is lifting the comparative social status of its service section to the same plane as engineering and manufacturing with construction of a new technical service laboratory.

Policy is to give this sometimes neglected segment of the industry the same technical approach that the others have received. It is aimed at helping the 6400 Ford dealers who in turn employ some 48,000 service personnel.

New laboratory will house 150 service department employees and will be equipped with a model garage, classrooms and office area. Carl T. Doman, service manager of Ford Div., will direct laboratory activities and training methods of 33 district service schools and mobile service training units in the field.

DIVERSIFICATION:

Chrysler items cover artificial leg parts, freight car shocks.

Chrysler's newsworthy accomplishments last week happened to come in areas far removed from the automotive industry. In fact, they came in such widely separated fields as artificial limbs and freight cars.

A. J. Langhammer, president of Chrysler's Amplex Div. disclosed how a ⅛-in. bearing produced from copper and tin powders has been developed for the hip joint of artificial legs. It permits an amputee to walk with a natural leg position.

The oil cushioned, self-lubricating Oilite bronze bearing replaces a ball bearing which was used in the joint. First a rolled piece of copper wire was tried, but this squeaked, needed constant oiling.

Wide Range—Amplex has done much of the development in the use of powdered metals, particularly of a self-lubricating nature. Products range from the leg bearing to a giant size bearing weighing 235 lb, considered the world's record for a metal powder item.

On the freight car side, 880 new ammunition-carrying freight cars equipped with Chrysler-designed shock absorbing trucks have gone into service for the Navy.

The trucks enable the cars to carry ammunition and fragile cargo at high speeds with safety and freedom from damage. Key is their use of a balanced, pendulum-type suspension and special shock absorbers. These give constant friction action and eliminate the problems of hydraulic snubbers in railway service.

Less Shocking—In one test run, 3179 vertical and 592 lateral shocks were recorded in a given period of time in a car with standard trucks. On the same train, a car equipped with Chrysler trucks recorded only 103 vertical and 64 lateral shocks.

Cars were built by Pullman-Standard and the trucks by the Symington-Gould Corp.

THE BULL OF THE WOODS — By J. R. Williams

MIND IF I TOUCH UP THIS TOOL A BIT? I GOT A RUSH JOB ON, AN'--
GO ON, GO AHEAD AND SHUT UP! GET THROUGH!
HE SOLED HIS SHOES AT HOME WITH OLD BELTIN' AN' SHAPES 'EM AT TH' SHOP ON TH' EMERY WHEEL-- I MEAN HE'S TRYIN' TO!
YEH, THEY'LL KEEP HIM HOPPIN' MAD HALF OF TH' NIGHT! HE'LL JUST HAVE TO PUT HIS FOOT DOWN!
J.R.WILLIAMS
1-30
BORN THIRTY YEARS TOO SOON

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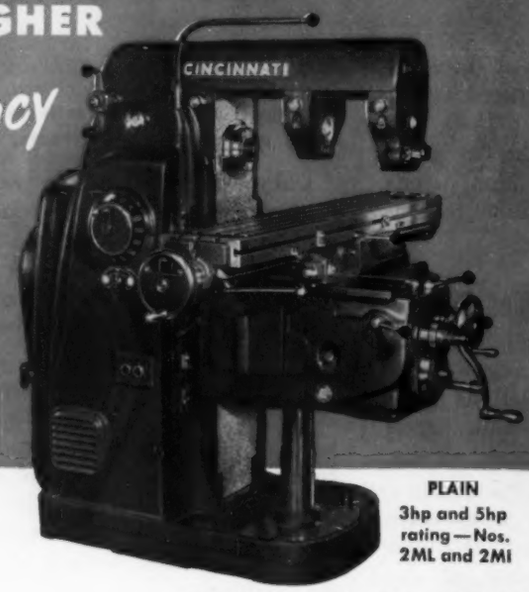

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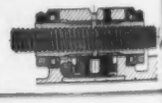
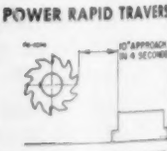
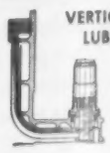
1 Choose the theoretically correct combination of speed and feed for the cutter and work material. Scale up or down to suit rigidity of fixture and work.	16 spindle speeds 25 to 1500 rpm 16 feeds ¼" to 30" per minute	SPEED DIAL
2 Change speeds and feeds as often as required to maintain highest cutting efficiency.	Quick, easy selection of speeds and feeds; one-half turn of a crank right or left.	CHANGING SPEEDS
3 Employ "climb" milling whenever it is advantageous. Especially desirable for thin parts and reciprocal milling.	Automatic backlash eliminator (extra equipment). Activated during feed stroke; free during rapid traverse.	BACKLASH ELIMINATOR 
4 Take heavy cuts, up to the full power of the machine when work and fixture permit.	Dynapoise overarm smooths out the cutting action.	DYNAPOISE OVERARM
5 Employ rapid traverse whenever possible, to reduce time spent in "cutting air."	Power rapid traverse, 150" per minute.	POWER RAPID TRAVERSE 
6 To reduce or eliminate maintenance expense, attend to lubrication requirements faithfully.	Automatic lubrication of parts in column, knee, vertical screw. Oil shot for saddle and table.	VERTICAL SCREW LUBRICATION 

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Iron Ore Future Is Still Steel's Job

FTC charge of steel concentration in ore business greeted by congressional "So what?" . . . Report stirs no action from either party . . . RFC may go out of business—By G. H. Baker.

The "So What?" attitude on Capitol Hill toward Federal Trade Commission charges of "concentration" in the iron ore industry may safely be interpreted as meaning that Congress won't try to tell the steel industry how to run its ore mining business.

FTC's lengthy (157 pages) report to a House "monopoly-investigating" subcommittee has caused scarcely a ripple on either the Republican or Democratic sides of the aisles. And it's interesting to note that the subcommittee, headed by Rep. Emanuel Celler, D., N. Y., went out of business early this month. Neither party made a serious move to set it up again.

Not Constructive—Typical congressional attitude toward the FTC report that iron mining is now largely in the hands of the steel companies: "Who else is going to do it?" FTC views with alarm, the disappearance of the "spot market" in iron ore and of independent ore merchants.

But it does not explain how independent ore merchants were—or could ever be—in a position to finance the huge exploration programs which must precede the development of new ore fields, or why it thinks independent merchants would have sufficient incentive to enter new mining projects which may be decades in paying off.

Get Tough—Firms holding defense contracts may be in line for a set of tough new federal orders barring discrimination in their employment practices. Recommendation that such a "get-tough" policy be adopted is now before President Eisenhower.

Anti-discrimination clauses in government contracts and subcontracts are not new. They've become a standard feature of government contracts in recent years. But enforcement is lax in nearly all cases, nonexistent in others. A trickle of complaints has been fairly constant, but corrective action has been absent.

Whose Fault? — Washington complains that it lacks the police force necessary to enforce nondiscrimination policies. Industry, wishing to avoid any more personnel problems than it already has, frequently has been an unwilling violator of so-called "equality" clauses.

Anxious to remain at peace with some unions, management has often agreed to organized labor's demands that Negroes, for example, be barred from employment in certain positions.

FRIENDS?: Secretary of Labor Martin P. Durkin (left) shakes hands with Sen. Robert Taft, who previously called Mr. Durkin's selection "incredible."

The report now being studied by Mr. Eisenhower states bluntly that Negroes "bear the brunt of discriminatory practices." It calls for "strict enforcement" of nondiscrimination provisions in all contracts in excess of $10,000. About 90 pct—dollar-wise—of all government procurement would thus be covered.

May Fold Tent—The nation's biggest source of non-bank business loans — the Reconstruction Finance Corp.—may go out of business this year. It's not definite yet, but there is serious talk at the Capitol of folding the 21-year-old agency which has been an ace-in-the-hole source of credit to many a struggling business firm in its multi-million dollar career.

Closing of the agency would not mean an end to business loans granted in Washington. "Emergency" loan functions, under the present plans, would be transferred to other agencies.

And non-loan activities of the RFC, such as operation of the Texas City tin smelter, also would be transferred. General Services Administration presumably would be asked to take on the Texas City operation. RFC is just about out of the rubber business. Since World War II, it has been steadily liquidating its holdings of rubber-making facilities to private industry.

Brain Crop Dropping—Declining rate of "production" in the training of scientists means that U. S. industry is to feel a real pinch in its research programs within a few years. New government surveys of scientific education show that the "output" of scientific personnel is decreasing at the alarming rate of 10 pct annually.

Russia, according to government figures, is expanding the size of its engineering and technical institutions. Estimates show that there'll be about 50,000 Red en-

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gineers and scientists turned out annually in another 2 years.

Solution?—One answer to the shortage here may be to increase the amount of federal funds available for scientific and engineering scholarships. In this fiscal year, about $3.5 million in appropriations is available for such scholarships. Jumping this figure to at least $15 million is believed, by some experts, as an immediate "must" if the U. S. is to reverse the present downward trend.

Air Force Keeps Spending Lead

Air Force procurement officers, looking ahead to a departmental goal of 106 air wings by June 30, are keeping their service ahead in the obligation of funds for fighting equipment, military construction, and plant expansion.

Latest Defense Dept. statistics show the Air Force had obligated $7.8 billion for these purposes in the 5-month period ended Nov. 30, during which the Army and Navy had accounted for $3.8 billion and $2.8 billion, respectively. Amounts listed reflect orders placed with both private industry and military-run facilities such as arsenals and shipyards.

Jointly, the services obligated $11.8 billion for "hardware," including planes, weapons, tanks, and ammunition; $1.5 billion for clothing, food, and fuel; and $1.1 billion for construction. When such programs as pay and allowances and research and development are added to the $14.4 billion listed, Defense Dept. obligations for July-November total $22.2 billion.

Guided Missiles Group Set Up

Companies building guided missiles are eligible for membership on a new committee being formed by Aircraft Industries Assn.

This group will help the industry work out its problems on research, design, development, building, and testing of weapons. It will also assist military requirement and procurement specialists in obtaining quick action on missiles.

SMALL BUSINESS:

SDPA proposes tax changes . . . Earnings needed for working capital.

Tax relief for small business is the theme of a letter and report sent by Small Defense Plants Administrator John E. Horne to several congressional committees.

Changes in the tax laws, he states, would help small firms retain enough of their earnings for working capital, plant expansion, and modernization. He maintains that the present structure "seriously inhibits" opportunities for promoting small business growth.

Suggested — Specific proposals made by Mr. Horne are:

1. If the excess profits tax is retained, raise the exemption to $100,000.

2. Do away with all corporate taxes on the first $10,000—or as much as $100,000, if "revenue needs dictate"—of distributed dividends.

3. Raise the surtax exemption to $100,000 and increase the normal tax to 25 pct.

4. Where corporate assets are not more than $1 million at the opening of the tax year, allow up to 50 pct of the depreciation basis to be deducted, at the discretion of the taxpayer.

Copies of the proposals were addressed to the Senate Finance Committee, House Ways and Means Committee, and the Small Business and Banking and Currency Committees of both houses.

MERGER PLANNED: George Meany, AFL president, left, and CIO President Walter Reuther talk over the proposed merger of the two labor groups at lunch in Washington last week.

Army Atom Weapons School Plan

Army personnel trained as engineers, physicists, or mathematicians are going to be selected for extensive atomic weapons schooling at Sandia Base, N. M.

Included in the instruction will be research and development activities, staff work entailed in using the new weapons, liaison, procurement, and supply functions.

Volunteer officers from first lieutenant up, both regulars and reservists, will be taught their jobs at Sandia, the site of an Atomic Energy Commission engineering laboratory and the Armed Forces Special Weapons Project.

Shipbuilding Wage Hike Set

Some 21,000 employees in Bethlehem Steel's shipbuilding division are in line for pay increases averaging 10 pct, made available by a Wage Stabilization Committee action.

Effective date of the hike was made retroactive to last Aug. 27.

New hourly rates in key positions are: First class mechanic, $2; handyman, $1.72; helper, $1.59; and laborer, $1.49.

WSC Chairman Charles Killingsworth said recently his group will draft a resolution to allow staff approval of similar increases in other shipbuilding cases. About 50 such cases are awaiting a WSC decision.

New J-40 Engine Order Placed

An additional multi-million dollar order for J-40 jet aircraft engines has been placed with Lincoln-Mercury by the U. S. Navy. Increase brings the division's defense production orders to a total of approximately $154 million.

Engines will be assembled at a new plant which Ford is building for the Navy at Romulus.

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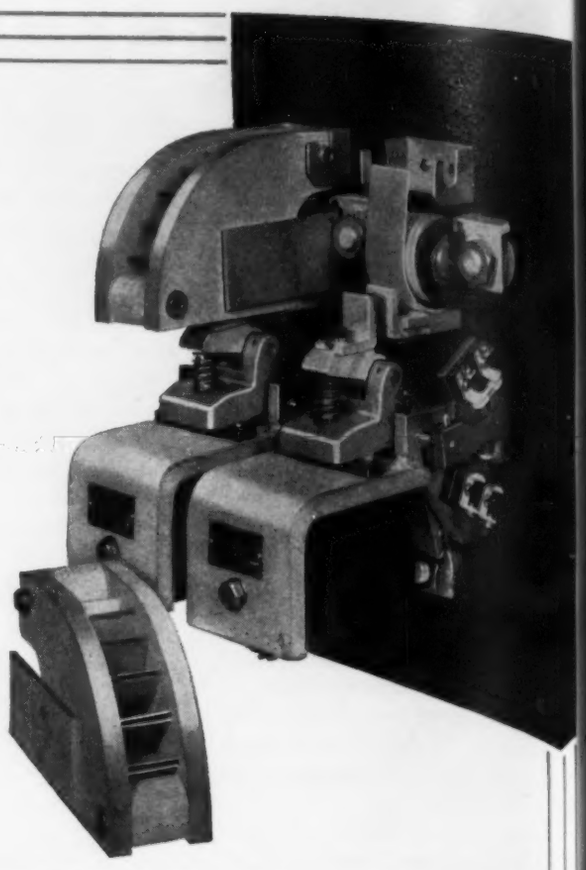

EXHAUSTIVE FIELD AND FACTORY TESTS have proved the remarkable durability of the new Type 260 DC Contactor. In the development of this heavy duty contactor, Allis-Chalmers engineers consulted and worked with steel mills . . . to meet their exacting requirements . . . to comply with their design preferences . . . *to assure you efficient, reliable performance under the most severe operating conditions.*

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Mill Type 260 DC CONTACTOR

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INCREASED CONTACT AND CHUTE LIFE — Contact erosion and chute carbonization are reduced by an entirely new and exclusive principle of arc interruption. Pronounced rolling action of the heavy forged copper main contacts minimizes destructive scuffing and extends contact life.

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NEW Fast Arc Centering Blowout

Arc Chute Assembly consists of triangular metal plates with U-shaped segments mounted alternately. Plates are insulated from each other and are placed at right angles to circumference of contact travel.

Metallic segments act as individual blowout coils.

Arc is forced upward along arc runner by blowout coil and impinges on metal segment of arc chute.

As contacts separate further, arc is stretched across an increased number of segments.

Arc rises quickly due to thermal and magnetic action of each individual metal segment.

Scrap Dealers Fear Dark Days

Western steel mills have slowed metallics buying almost to a standstill . . . Prices cut on all but No. 1 heavy melting . . . Yards cut crews, stress quality—*By T. M. Rohan.*

Western steel mills are up to their ears in scrap these days and dealers are scrambling harder than ever to unload stocks.

In what is generally the busiest season, California mills have slowed down buying from a moderate 25 pct cut to an absolute stoppage. One major producer has an all time record inventory on hand. Another has suspended all buying until well into February. Strings of over 35 still-unloaded cars are to be seen.

Ship to East—One dealer expects to ship 6000 tons accumulated scrap from the Pacific to eastern Canada by water freight. This, if it materializes, would be the first such move in years.

The usual dealer stratagem of overshipping 10 or 15 pct which in a tight market is welcomed by mills now receives a stern warning. And inspectors are getting fussier than ever.

Price Drops—The tight market brought a $2 drop over the weekend for the Los Angeles and San Francisco areas in most grades by large consumers. First announcement to dealers came late Friday and remainder was announced early this week. Drop was effective Feb. 1. It applies to all steelmaking grades except No. 1 heavy melting, still at ceiling.

Contributing factors have been the build-up during the strike, the still relatively high price compared to steel selling price, jacked-up ceiling prices which were about $5 a ton over going rate on Feb. 7, 1951.

Dealers Gloomy—From the traditional pessimistic dealer viewpoint, dark days loom ahead. Incoming scrap has been erratic, some getting 25 pct higher and others considerably below normal as collectors turn to more lucrative fields.

Most have cut their yard crews and are working remaining men harder on getting out only cleanest, most marketable grades. Recent wage increases of about 12¢ per hr including a welfare plan have cut profits. Many dealers can't even get in to see steel mill buyers these days to buy them a dinner.

Seattle's Different — Only in Seattle are things different. This area traditionally does not generate enough scrap to support a long-term capacity production.

Regular plants are all producing well and the new Seidelhuber mill has furnished a small new market. At Seattle only No. 2 bundles are under ceiling. But cast is as bad as everywhere else.

Restore Power — Bonneville Power early last week finally got the go-ahead to restore 238,000 kw interruptible power after a weekend wait. This restored full 388,000 kw cut started in September due to drought. By midweek, 110,000 kw was already in use and at week's end about 149,000 kw.

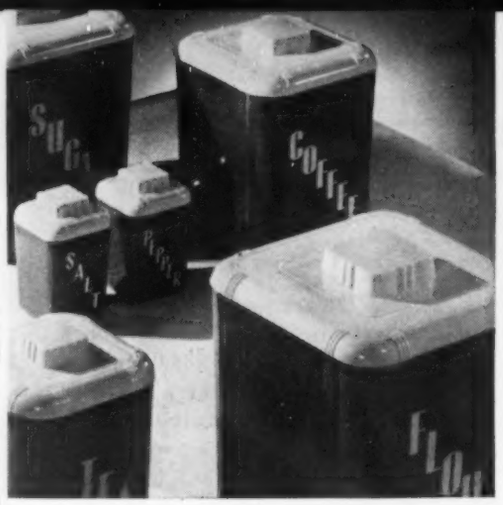
Aluminum plant output was boosted by about 200 tons daily but full power consumption is not expected until about Feb. 15. Some steam generation is still being used and power officials are apprehensive about lack of snow for a spring run-off. But torrential rains have filled dams to overflowing this winter. A heavy February freeze could also cause another water shortage.

Bethlehem Stoppage—The 4-day walkout of electric furnace employees at Bethlehem's Los Angeles plant which cost an estimated 3600 tons ingot production was officially registered as grievances over seniority at week's end.

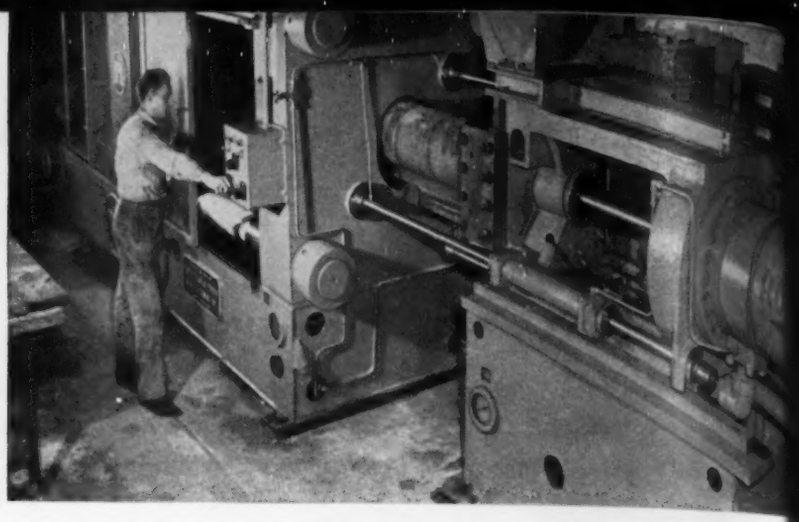
The furnace department walkout to attend a special union meeting idled 700 production workers and stopped most operations except the nut and bolt plant and wire mills.

Fast Writeoffs — In San Francisco, Bethlehem's Shipbuilding Div. received a National Production Authority certificate for accelerated tax writeoff on $1 million tools and equipment for shipyard repair work.

Smaller certificates went to Rheem Mfg. Co., Richmond, Calif., for ordnance equipment, Douglas Aircraft at Santa Monica for aircraft equipment and Union Steel at Los Angeles for military steel fabrication equipment. Douglas also recently announced a $2 million Long Beach Div. expansion for continued production of C-124 Globemasters and RB-66 long range jet reconnaisance bombers.



NO MORE PROBLEMS. The production of plastic household items by Rona Plastic Corporation was slowed down by an inadequate hydraulic oil. A switch to Sunvis 999, over a year ago, restored it to normal.



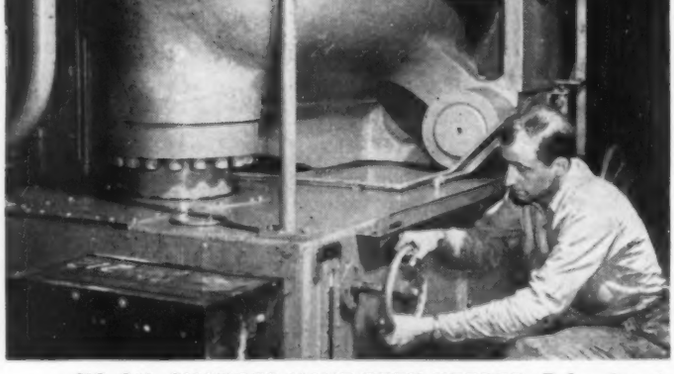
PRESSURE LOSSES ENDED. There are few plastic molding machines as big as this 60 ounce model. It exerts a pressure of 1,000 tons. Because the hydraulic oil formerly used sludged up and thinned out, it could not maintain this pressure. But Sunvis 999 has fully met these severe requirements, as well as those of Rona's nine other hydraulic machines of varying sizes.

PLASTIC MOLDER'S BOTTLENECK ENDED BY SUNVIS HYDRAULIC OIL

More than a year ago Rona Plastic Corporation, New York City, had trouble with its hydraulic molding machines. The machines functioned erratically due to oil sludge sticking the control mechanisms. In addition, the oil thinned out excessively at normal operating temperatures, and resulted in the loss of proper clamping pressures on the dies. To keep the machines going at all, it was necessary to drain, clean, and entirely recharge the systems at frequent intervals.

A Sun representative, called in by Rona, studied the problem and recommended Sunvis 999. He knew it would put an end to pressure losses, because, even at elevated temperatures, it does not decrease in viscosity as much as most other oils. He also knew its exceptional stability would end the sludging problem.

Sunvis 999 proved to be the answer to all Rona's hydraulic oil problems. The original charges, with minimum make-up, are still giving good service. Rona can expect the same performance for a long time to come, because experience shows that under normal operating conditions, Sunvis 900 Series Oils are *good for the life of the equipment.*



NO OIL CHANGES HAVE BEEN NEEDED. Before Sunvis 999 was adopted, the oil in each of the machines had to be changed frequently (the one pictured holds 450 gallons). The original charges of Sunvis 999 have been in use now for more than a year.

Department IA-1

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Is Tool Market on First Bounce?

New machine tool orders show first increase in more than 6 months . . . Is it just a seasonal spurt? . . . Vance proposals would keep market firm for next 5 years—*By E. C. Beaudet.*

New orders for machine tools during December showed the first upward trend since last July, according to preliminary estimates of the National Machine Tool Builders' Assn. But it is too early to tell whether this is just a seasonal increase or represents a real change in market conditions.

December's preliminary index figure of 223.4 is an increase of 18 points from November. Shipments continued at a high rate of 351.8, as compared with 342.5 in the previous month.

Lack of planning by consumers is shown in the fairly high rate of cancellations which ran about 21 pct. Part of the gain in the new order index was due to an increase in the number of foreign orders which rose from 14.3 in November to 20.4 for December.

A Firm Market—Although the immediate sales outlook for the industry is clouded by uncertainties of government buying and lack of a real test of the civilian market due to government restrictions, some industry spokesmen predict a high level of operation for the next several years.

Basis of this optimism is the recent Vance Committee report. If recommendations contained in the report are adopted, many machine tool men believe the industry will be in good shape for the next 5 years.

Emergency Standby—Essence of the Vance report was recommendation that defense capacity be built up to meet demands of an all-out war. To do this the committee suggested strengthening industrial capacity rather than stockpiling military end items. Standby plants equipped and maintained would be held in readiness for production when and if a national emergency occurred.

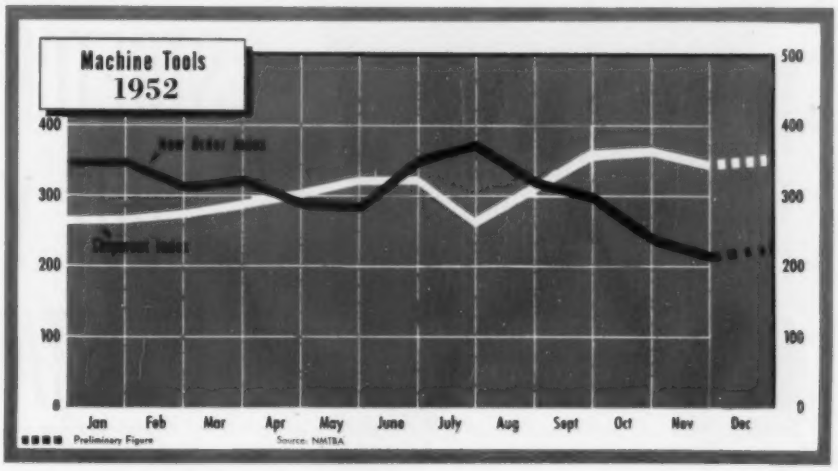
A $300 million expenditure for machine tools would be needed each year for several years to broaden the mobilization base. Cost of maintaining the base, including replacement and conversion of government-owned machine tools would mean roughly another $300 million worth of new machine tools.

With this type of support, civilian buying would not have to be excessive to maintain a high rate of operation. During 1952 the industry shipped a total of $1.25 billion worth of machine tools. If non-government purchases amounted to $300 million, overall yearly sales would approximate $900 million.

Can '52 Be Matched?—Many tool builders believe that the high shipment record of 1952 cannot be equaled unless an allout war develops. An $800 or $900 million yearly rate of sales would be sufficient to keep the industry in a healthy condition.

Vance Committee proposals if adopted, might also prevent the government from dumping machine tools at wholesale prices, if the threat to national security diminishes. Machine tools kept in plants on a standby basis cannot flood the market.

Manufacturers remember that at the end of World War II, a huge number of tools were put up for sale at ten and fifteen cents on the dollar. This helped keep the industry in a crippled condition until the Korean War started and government orders began to come in.



Need More Ammo—Manufacturers of turning equipment are looking forward to new orders resulting from the expected increase in government ammunition requirements. If this happens, lathe builders' backlogs will be strengthened.

A considerable number of orders for different types of turning equipment used in making 155 mm shells are expected to break soon. These will fill the requirements of four new shell lines which are expected to be in production this summer. So far the government has not shown too much interest in boosting ammunition programs. Most of the shells now being used are said to come from World War II stocks or lines.

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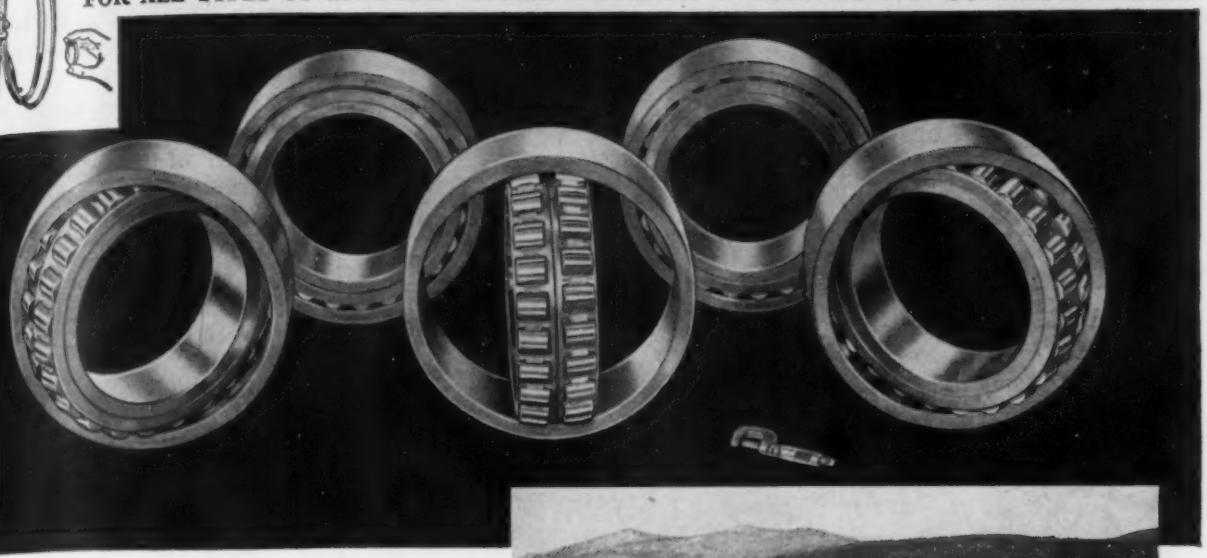

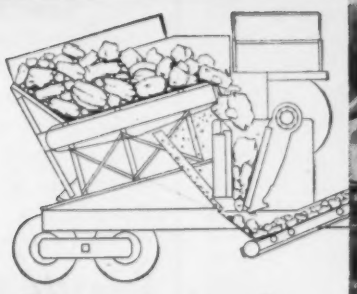

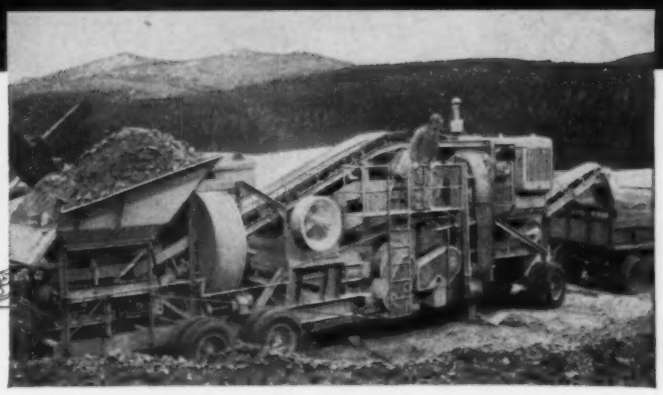

Spherical, self-aligning, anti-friction bearings, 8.6614" x 13.3858" x 3.5433", with one-piece bronze cage, as used in jaw crusher of this Cedarapids Junior Tandem Portable Crushing Plant, made by Iowa Mfg. Co., Cedar Rapids, Iowa. Other sizes of KAYDON Bearings, 12.5984" to 14.9606" Outside Diameter, are used on various models.

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History of the formation and growth of the Continental Steel Corp. is interestingly outlined in a brief new booklet. The publication gives a concise, factual record of the plants, products and leading personnel of the corporation and its subsidiaries. There are photographs of the facilities in Continental's different plants, a report on its financial history, and brief resumes of the corporation's leading executives. *Continental Steel Corp.*

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Cost control

Manufacturing Cost Control contains break-down charts, cost control forms and performance curves that show how management of modern metalworking plants can cut costs by instituting adequate manufacturing cost control systems. A five-step method of setting up such a control system is described in detail. *Harold F. Howard Co.*

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Electric furnaces

Described in a new bulletin is the Speed Treet Electric Furnace, designed to heat treat high speed steels where temperatures up to 2600°F are required. Also covered is the Hevi Duty Tool Room Combination which consists of an atmosphere generator, preheat, high temperature and tempering furnaces. Many industrial users are reported to have found this combination extremely valuable in heat treating tools and dies. *Hevi Duty Electric Co.*

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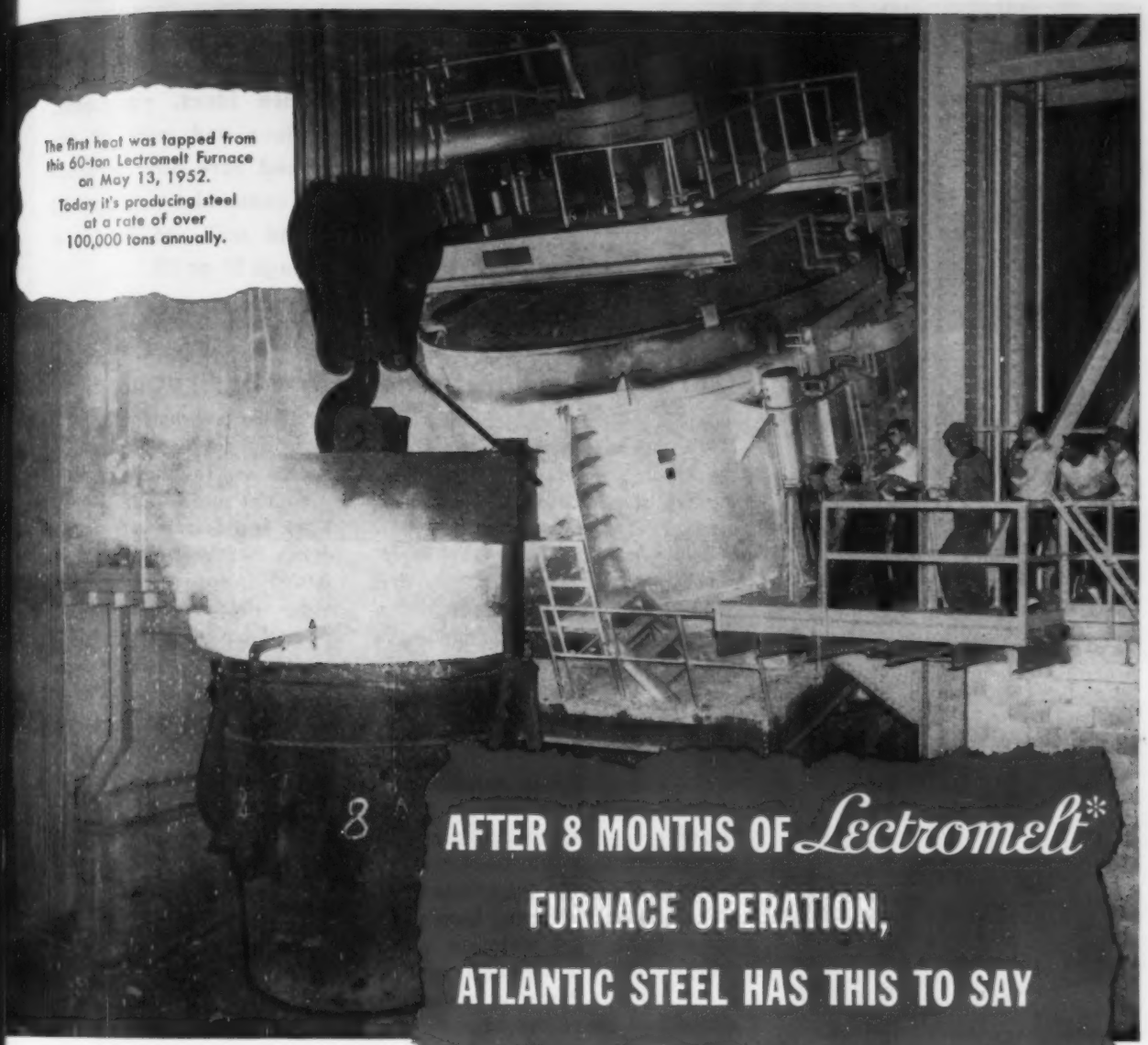
Gages, controls

Pratt & Whitney continuous gages and controls make it possible to exercise constant, precision control over quality products during manufacture. Dependable gaging to very close limits is accomplished without stopping or even slowing the manufacturing process. Information on these units is contained in a new booklet. *Pratt & Whitney, Div. Niles-Bement-Pond Co.*

For free copy circle No. 17 on postcard, p. 81.


The first heat was tapped from this 60-ton Lectromelt Furnace on May 13, 1952.
Today it's producing steel at a rate of over 100,000 tons annually.

AFTER 8 MONTHS OF *Lectromelt** FURNACE OPERATION, ATLANTIC STEEL HAS THIS TO SAY

It's too soon to draw final conclusions, of course, comparing electric furnace operation with our open hearths. Production continues to rise and costs are coming down, as procedures are smoothed out. But we have made these observations:

- Time per heat is about half that required by an open hearth.
- Average down time is much less, even for major repairs. An electric furnace is available 94% of the time.
- Average size of heat 67.12 tons. Yield per ingot is 5% better.
- Metal cost is lower because we don't use pig iron with the electric furnace.
- Fewer man-hours per ton are required.
- After only five months, we got our electric furnace steel costs down below those of our open hearths.

Atlantic Steel Company laid out their plant, from scrap storage yard to pouring pit, around this Lectromelt Furnace. This certainly contributes greatly to these economies. Pittsburgh Lectromelt Furnace Corporation, 312 32nd Street, Pittsburgh 30, Pennsylvania.

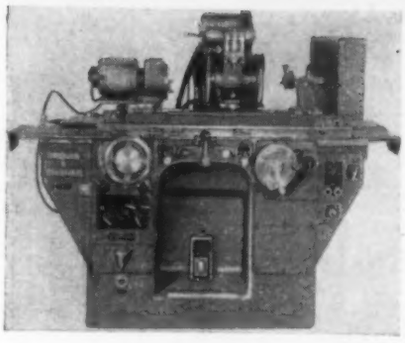
***Manufactured in** . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa.

*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT... MOORE RAPID *Lectromelt*

NEW EQUIPMENT

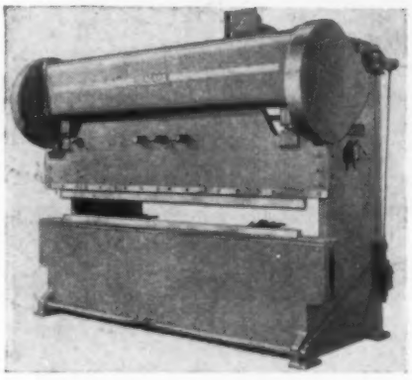
New and improved production ideas, equipment, services and methods described here offer production economies . . . just fill in and mail the Postcard on page 81 or 82.



Increased flexibility meets today's requirements

The No. 1 universal grinding machine, one of a series of four new universal grinders, combines flexibility with production. It has unit type wheel spindle with antifriction bearings and sealed lubrication. Wheel speeds of 2500, 3000 and 3600 rpm provide maximum in wheel efficiency and economy. An independently driven, instantly available internal grinding spindle is standard equipment. Table speeds are infinitely variable from 3 to 150 ipm. Infinite number of work speeds range from 60 to 600 rpm. Fine cross feed, adjustable to 0.0001 in. on work diameter, provides extremely accurate sizing. *Brown & Sharpe Mfg. Co.*

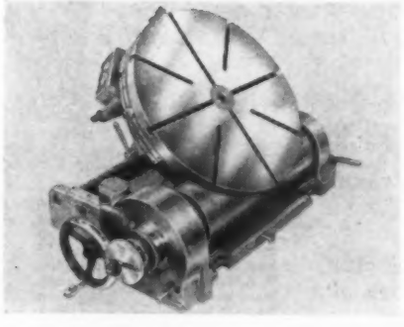
For more data circle No. 18 on postcard, p. 81.



All-steel press brakes perform many operations

A new line of all steel press brakes includes 50, 100, and 150-ton series. Bending, curling, jogging, corrugating, notching and punching are a few of the many operations these machines can perform. Laminated non-metallic ways maintain accurate alignment and reduce wear to a minimum. Powerful air cooled clutch and brake can be controlled either by foot treadle or by palm buttons fastened to the ram which permit jogging, single stroking and continuous operation. A deep crown and twin plate bed permanently welded to the side frames form a rigid one piece frame which maintains accurate alignment. *Niagara Machine & Tool Works.*

For more data circle No. 19 on postcard, p. 81.



Tilting rotary table features power rotation

A high degree of accuracy together with power rotation makes a new 24-in. diam tilting rotary table extremely versatile. Power rotation is provided by a 3 phase ½ hp shell-type motor that has been built into the table pivot. The table is rotated through 360° in either direction, in any plane of arc, by pushbutton controls; a hand wheel with a self-centering spinner knob permits fine adjustments. Table graduations in degrees are read directly off the table; minutes, on the table rotary wheel dial. The table tilts from 0 through 90°. *Pratt & Whitney.*

For more data circle No. 20 on postcard, p. 81.

Load-pusher speeds bulky-load handling

New load-pusher attachment for fork trucks speeds handling bulky, unpalletized loads such as baled scrap and paper. The pusher allows fork truck users to pick up large, unpalletized loads, haul them to discharge points and unload them in seconds, with no manual handling involved. It can be used to unit-load highway carriers which fork trucks cannot enter. The operator pushes loads into the carrier without entering it. Two sets of levers move the pusher arms. Positive control over pushing pressure is available from the driver's position, through use of a metering valve. *Baker-Raulang Co.*

For more data circle No. 21 on postcard, p. 81.

Turn Page

Industry's Newest Cost Cutting Method: Hydroforming

CINCINNATI 26" HYDROFORM
Also built in 12", 19", 23" and 32" standard sizes. Machine size indicates maximum blank diameter that can be formed. Material thickness can range from foils to ⅜" steel. Bulletin M-1759-1 gives data on the Hydroforming process as well as machine specifications. Write for your copy.

Hydroforming has given industry an improved, *simplified* deep drawing process. Parts can be drawn of more intricate shape — having improved mechanical and physical values — in far fewer operations than common practice allows.

Tool costs run as low as 10% of conventional die set costs, making short-run production exceptionally economical. Trial parts are quickly produced. Tools can be readily modified to suit changes in part design. Different gages and types of materials can be tried, drawn on the same set of tools.

Hydroform tooling consists of the simplest elements of conventional tooling—a male punch and one draw ring. A built-in universal die member takes the place of the female die and the other parts of conventional tooling. Sheet materials, held between the punch and the universal die, are formed to the shape of the punch by *controlled* hydraulic pressure.

Investigate Hydroforming for your production. It will change your thinking on deep drawing and forming. The Cincinnati Milling Machine Company representative in your area will gladly give you detailed information. In addition, at the "Mill" in Cincinnati, a Hydroform laboratory is maintained where runs of sample parts are produced and where this revolutionary deep drawing principle can be demonstrated most effectively. Interested manufacturers are invited to inspect these facilities.

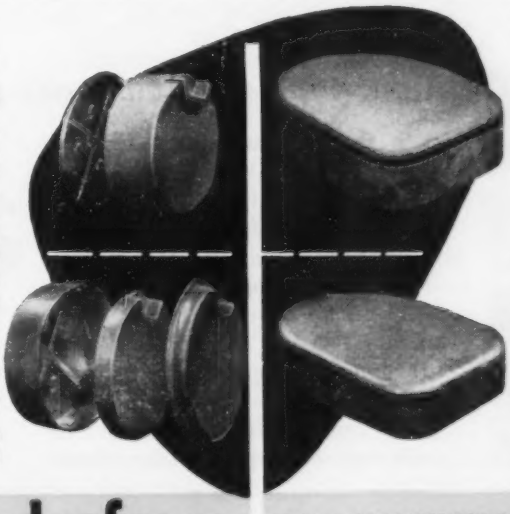
HERE'S WHAT HAPPENS WHEN HYDROFORMING ENTERS THE PRODUCTION PICTURE

ELECTRONIC INSTRUMENT CASE
0.040" Aluminum
FORMER METHOD Deep Drawn and Fabricated
12 Operations Total

Photo shows, in sequence form, the operations formerly required to produce this part. The shallow cover was drawn in 1 operation; the body required 2 draws, to sharpen the inside radius. The body was then notched to receive a plug receptacle, which was hand fabricated and welded in place.

HYDROFORM METHOD Deep Drawn
7 Operations Total

By re-designing the part to take advantage of Hydroforming capabilities, the part that was previously the cover became the body, produced complete with locating edge in 1 forming operation on a 12" Hydroform machine. The cover, with plug receptacle as an integral part, was formed in 2 operations.



GEAR CASE COVER, 16 ga. Steel
FORMER METHOD Fabricated
8 Operations Total

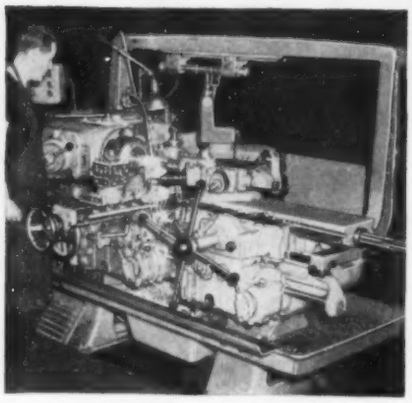
Previously produced, as photographed, in 2 sections, formed on a press brake. The sections were welded, ground and polished to remove excess weld material and re-shaped to fit the area to be covered.

HYDROFORM METHOD Deep Drawn
3 Operations Total

The part is now Hydroformed complete in 1 draw, then trimmed. The photo at top of page shows the part being drawn on the 26" Hydroform. The saving in fabrication time alone paid for the cost of tools used to Hydroform this part, although less than 300 of these covers are required per year. The Hydroformed covers are held to close tolerance, eliminating a fitting problem that existed when these parts were fabricated.

CINCINNATI **Hydroform**

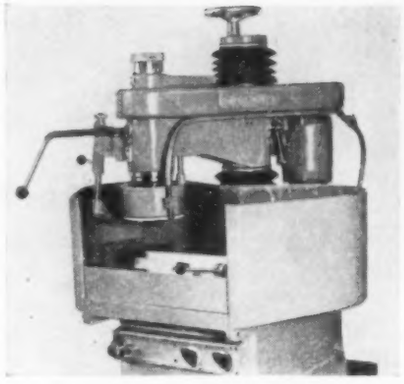
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.



Tracing attachment for J&L turret lathe

A completely new turret lathe hydraulic tracing attachment is designed for exclusive use on any J & L ram or 7A saddle universal bar or chucking machine for general tracing, multi-step shaft, and contour work. The attachment is powered by a differential type cylinder. The tool-carrying slide is mounted on a 45° angle with the spindle axis. The cylinder stylus, and cutting tool are mounted on the back of the cross slide on a bridge-type carriage, freeing the square turret for other operations on the same piece. In addition to actual tracing and taper-turning functions, the attachment makes available all known facilities of a turret lathe, in effect, on a profiling lathe. The tracing mechanism can be disengaged simply by turning a switch. *Jones & Lamson Co.*

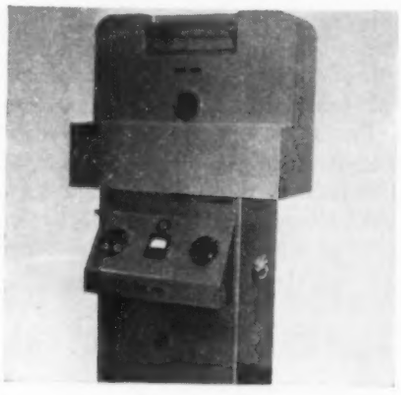
For more data circle No. 22 on postcard, p. 81.



Time saver in grinding flat surfaces

The Bruckner precision surface grinder uses a vertical spindle and cup wheel. Work is placed on the table or magnetic chuck and the cup wheel is passed rapidly over the work by hand for rough grinding. A hydraulic feed is then engaged for finish grinding. Vertical adjustment of the spindle is by means of a hand wheel. Fine adjustment is by a large diameter graduated drum reading in 0.0004 in. The machine uses 7½ in. diam standard Norton cup wheels. A diamond dresser is attached to the wheel housing and instantly available for dressing the wheel. The machine comes equipped with pump and piping for wet grinding. *George Scherr Co., Inc.*

For more data circle No. 23 on postcard, p. 81.



Ultrasonic waves used to clean metal parts

Fast efficient degreasing of small precision workpieces is possible with the new Circosonic cleaning machine. Heart of the degreaser is the ultrasonic generator developed by GE, and used in conjunction with Circo vapor degreasing equipment and technique. The generator converts high frequency electrical energy into high frequency mechanical vibrations by means of a quartz crystal. This energy is transmitted up through the cleaning tank. The region above the crystal is greatly agitated, accelerating the normal cleaning action. In this zone the cleaning is accomplished. After the ultrasonic cleaning action, parts are rinsed by fresh, clean fluid and quickly dried by the vapor process, emerging sparkling clean. *Topper Equipment Co.*

For more data circle No. 24 on postcard, p. 81.

Rider-type straddle truck maneuvers easily

Both short in length and light in weight, the Yale Warehouser, a new rider-type, electrically-powered fork lift straddle truck, is designed for right-angle tiering in 5 to 6-ft-wide aisles, and for operating in elevators and on flooring that will not sustain heavier rider-type electric lift trucks. The truck features three speeds forward and three speeds reverse, with time-delay controls between speeds for smooth acceleration. Available in 2000 and 3000 lb models, it can lift loads as high as 133 in. to maximum use of air-rights. Drive unit consists of a horizontally mounted motor with direct gear drive to splined axle. Steering unit provides a 200° steering arc. Power is turned off and brakes applied when operator leaves truck. *Yale & Towne Mfg. Co.*

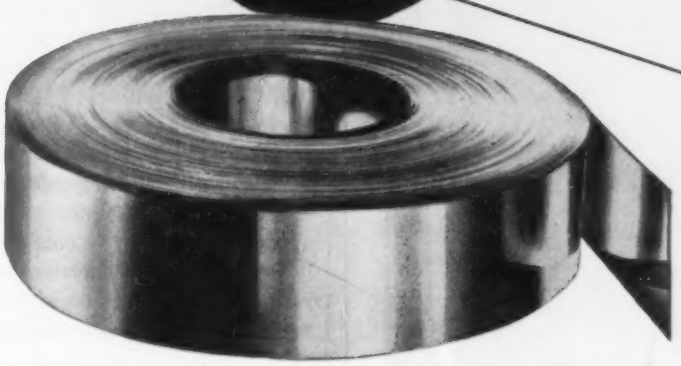
For more data circle No. 25 on postcard, p. 81.

Turn Page

KEEP THESE COSTS

PAINLESS

SPECIFY CMP THINSTEEL STAINLESS cold rolled strip



CMP stainless strip Thinsteel has a reputation for successfully keeping costs in line for fabricators where unusual requirements are paramount.

Particularly in the 300 series stainless grades you can have sizes, finishes, and physical properties not commonly available. As an example, you can specify 18-8 stainless in dead soft temper, with a mirror finish on both sides; or strip with total gauge variation from edge to edge held to less than 25% of standard; or strip as thin as .001"; or strip with hi-tensile values well over 200,000# PSI.

If Government Controls or Restrictions force consideration of substitutes for the nickel-bearing 300 series, perhaps we can assist you in developing one of the CMP 400 chromium series as a satisfactory replacement. Type 430, for example, is now commonly substituted for various end uses which formerly involved the 300 series.

So—if you have a difficult stainless strip problem why not check with CMP right now. You'll find prompt and interested attention.

PRECISION COLD ROLLED CMP THIN STEEL

the Cold Metal Products co.

YOUNGSTOWN 1, OHIO

New York • Chicago • Indianapolis • Detroit • St Louis • Los Angeles • Cleveland

LOW CARBON, HIGH CARBON (Annealed or Tempered) ***STAINLESS AND ALLOY GRADES, ELECTRO ZINC COATED ARE AVAILABLE FROM:***

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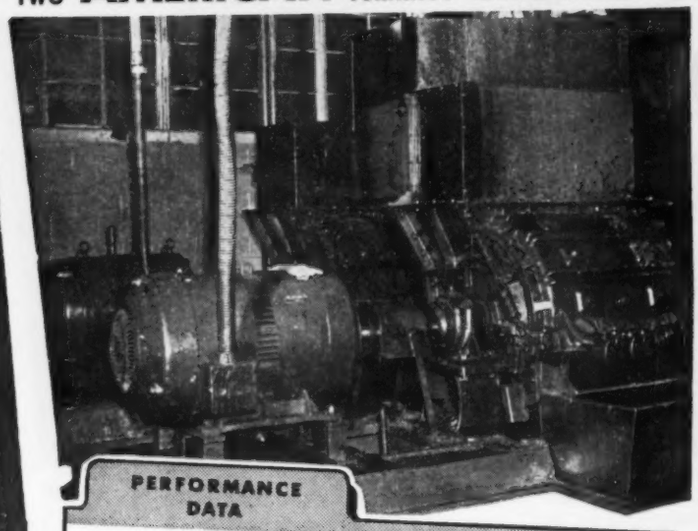
PRECISION STEEL WAREHOUSE, INC., 4425 W. Kinzie, Chicago • Phone: COlumbus 1-2700

More "CRUSHING" FACTS ON American CRUSHER PERFORMANCE

Case History No. 15

$60,000 ANNUAL GROSS PROFITS! WITH TWO AMERICAN METAL TURNINGS CRUSHERS



PERFORMANCE DATA

TWO CRUSHERS:	Model 3800's
AVERAGE AGE:	35 months
MONTHLY TONNAGE:	1200–1500 tons metal turnings
PARTS COST:	to date, for both crushers: $1599.80
COST PER TON:	$0.03, including standby parts

THE experience of many blue chip manufacturers have shown that there are three important profit sources in every American installation: (1) American-reduced chips bring $4 more per ton on scrap market (2) Up to 50 gallons of recovered cutting oil per ton of reduced turnings (3) less storage . . . easier handling.

Let American show you how you can turn your scrap into profit.

WRITE for Bulletin: "Metal Turnings Crusher."

American PULVERIZER COMPANY

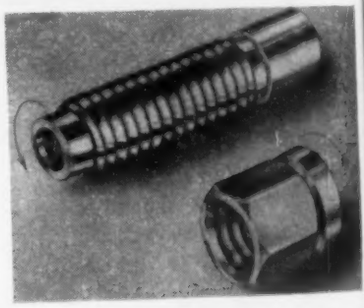
Originators and Manufacturers of Ring Crushers and Pulverizers

1439 MACKLIND AVE., ST. LOUIS 10, MO.

Redesigned welder

A redesigned 300 amp ac welding transformer features stepless current selection from 40 to 375 amp. The welder, for practically all applications from light duty, low-current sheet metal work to heavier-duty, high current industrial jobs, incorporates enlarged scale and finely threaded screw adjustment to facilitate easy current selections. It accommodates electrodes 3/32 to ¼ in. diam. A handy switch enables the operator to change quickly from high to low or low to high range. *General Electric Co.*

For more data circle No. 26 on postcard, p. 81.



Swivel shoe set

Positive holding of parts without marring surfaces is provided by new, low cost, swivel sets. They are simple to use and adaptable to any type of tool, jig or fixture. All parts are carefully machined to insure concentricity of shoe and pitch diameter of screw. Two types are available: Hexagon swivel, adaptable to any type and length screw, and swivel set, a socket-head screw with swivel shoe attached for use in tight quarters where movement is restricted. Various sizes are available. *Allied Air Parts.*

For more data circle No. 27 on postcard, p. 81.

Turn Page

New Equipment

Continued

Dry lubricant

For use in metal forming operations, Drawcote when applied to metal and dried thereon, forms a dry, protective and lubricating film. Stock can be stored for long periods, then used as desired without any reapplication or additional lubricant. Drawcote is easily removed from formed parts by a hot, mild alkali bath. The lubricant is a powder shipped in wooden barrels ready for mixing with water. It is applied by dip, spray, or an even flow over rough or highly polished clean surfaces. *Gilron Products Co.*

For more data circle No. 28 on postcard, p. 81.

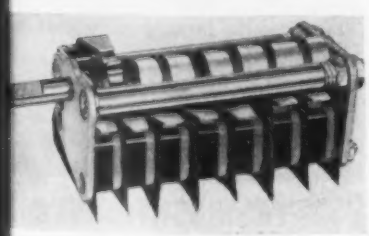
File kit

Illinite files are designed for power filing machine use and available in handy plastic kit. The kit contains a complete assortment of the 12 basic file shapes normally required in die filing work. Individual pockets for each file assure protection and identification. *Illinois Tool Works.*

For more data circle No. 29 on postcard, p. 81.

Switch assembly

A new series of extremely small size multiple rotary switch assemblies is adaptable to a variety of ac or dc switching applications. One of the most popular is a ganged assembly of seven Micro V3 type basic switches with single-pole,



double-throw contact arrangement. Each V3 switch measures 13/32x $\frac{5}{8}$x1 3/32 in., and the entire assembly measures 1½ x 1⅝ x 4¾ in. It has resistance to vibration. Cam combinations can be used to give any desired sequence of circuit control or switching arrangement. *Micro Div., Minneapolis-Honeywell Regulator Co.*

For more data circle No. 30 on postcard, p. 81.

Turn Page

WELDMENTS
CAN SAVE YOU MONEY!

Acme weldments are replacing castings for leading machinery and equipment manufacturers everywhere because they do a better job at lower cost. Experienced Acme engineers at work with Acme's complete fabrication facilities can give *you* these same advantages . . . Acme's new 24-page, illustrated booklet shows you why. *The Facts about Weldments and Castings* tells you what you should know about their relative strength, rigidity, vibration, design flexibility, and cost . . . facts to help you specify and save. And it's yours for the asking . .

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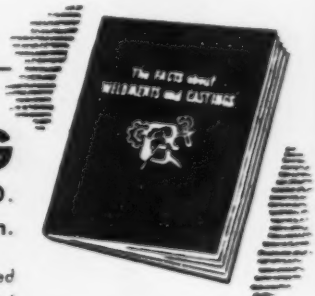

- A.S.M.E. Qualified Welders
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- Hartford Steam Boiler Inspection Service
- A.P.I. Approved
- Underwriters Label and Inspection Service
- Navy Approved

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WILLSON®
"Established 1870"

Dependable Respiratory Protection

Because Willson safety equipment is made after careful study of industry's needs, you get all the comfort and safety improvements *first* in Willson products. The complete Willson line of safety equipment includes more than a hundred face, eye and respiratory products for industry, farm and home—the most complete selection of safety equipment—and you can get them anywhere!

keep you on the safe side

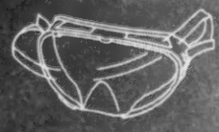
WILLSON RESPIRATORS

GAS MASKS

SAFETY GOGGLES

WILLSON RESPIRATORS

Wearer safety and wearer comfort are the two primary considerations in designing and making Willson respirators. Styles are available to protect against metal fumes, mists, gasses, vapors and all dusts. Most styles bear U. S. Bureau of Mines approval.



MONOGOGGLES®

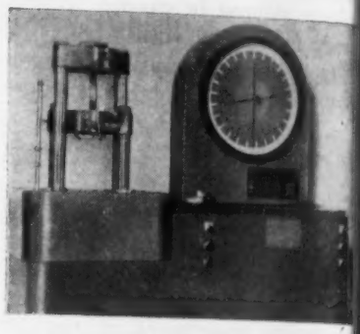
SAFETY SPECTACLES

See your WILLSON distributor or write for catalog

WILLSON PRODUCTS, INC., 231 Washington St., Reading, Pennsylvania

Testing machines

Three changes feature new model Baldwin 60-H and 12-H testing machines of 60,000 and 12,000 lb capacity. First, clear space between columns has been increased from 10 to 15 in. Second, without losing advantages inherent in a two-unit design, the machine has been built as a single unit. Separate framework for gage panel prevents the



shock of breaking specimens from being transmitted to the load indicator. Third, both machines are available with two types of indicators: One with two Emery 16-in. diam indicator dials, and the other with Tate Emery indicator with three ranges on a single 24-in. dial. *Baldwin-Lima-Hamilton Corp.*

For more data circle No. 31 on postcard, p. 81.

Water-type coolant

Wax-Cool, a new water-type coolant with wax, has been developed for use in metal-working machines that use water-soluble coolants. The product is said to have exceptional lubricating properties and minimizes heat at its source. It is a concentrate to be mixed with 20 parts of water before use. *S. C. Johnson & Son, Inc.*

For more data circle No. 32 on postcard, p. 81.

Flow test kit

A portable, wide-range flow test kit for laboratory research and field flow checking work consists of five Pyrex glass Tri-Flat metering tubes with five spherical constant-density floats and instruction handbook contained in a carrying case. Low flow rate measurements are not only predictable, but repeatable, with high accuracy. *Fischer & Porter Co.*

For more data circle No. 33 on postcard, p. 81.

Flame washing torch

Removing riser pads from castings with an oxyacetylene flame washing torch effects substantial savings of time in cleaning operations. The torch produces a washing, rather than a grooving or cutting action, leaving a smooth surface that seldom requires additional finishing. It is available with 20° or 75° heads with two sizes of tips. Only oxygen and acetylene gases are required for successful operation on steel castings. *National Cylinder Gas Co.*

For more data circle No. 34 on postcard, p. 81.

Static roof coatings

Useful on pitched or flat surface roofs, an improved fibrated asphalt emulsion is a static or non-flowing type of coating easy to apply by brush or spray. It will not become brittle in low temperatures; has no tendency to run, sag or craze when subjected to hot sun. Once the surface is coated with certified emulsion the water vehicle evaporates and the minute particles of asphalt fuse to form a continuous film having the pliability and high exposure resistance of the original asphalt. *United Laboratories, Inc.*

For more data circle No. 35 on postcard, p. 81.

Helmet attachment

The Vari-shade helmet attachment affords the welder greater visibility, continuous and better protection, and saves time of changing glass shades. It is quickly and easily installed on most standard helmets. By rotating the attachment, density of shade becomes continuously darker or lighter. *Polacoat, Inc.*

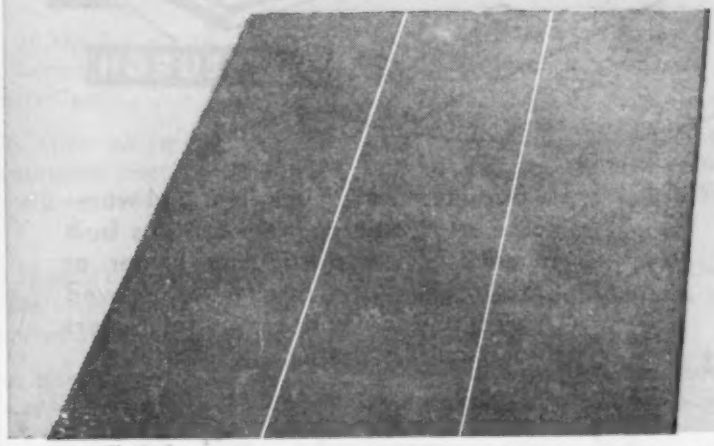
For more data circle No. 36 on postcard, p. 81.
Turn Page

FOLLANSBEE
COLD ROLLED STRIP
PRECISION ROLLED TO YOUR SPECIFICATIONS

Follansbee offers the special attention and services which only the flexibility of a compact organization can provide. If you need Cold Rolled Strip Steel, Follansbee merits your consideration as a source for your supplies.

Follansbee brings to the rolling of this staple product its many years of experience as a maker of high quality steel specialties. This means that you can rely on Follansbee to furnish you with Strip that meets your most exacting requirements in Temper, Gauge, and Width.

On your next order for Cold Rolled Strip—or other steels—it will pay you to check with Follansbee.



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GENERAL OFFICES, PITTSBURGH 30, PA.

POLISHED BLUE SHEETS AND COILS SEAMLESS TERNE ROLL ROOFING
COLD ROLLED STRIP

Sales Offices—New York, Philadelphia, Rochester, Cleveland, Detroit, Milwaukee. *Sales Agents*—Chicago, Indianapolis, Kansas City, Nashville, Los Angeles, San Francisco, Seattle; Toronto and Montreal, Canada. *Mills*—Follansbee, W. Va.

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When you want steel fast!

In addition to our main plant and warehouse at Pittsburgh, Levinson has built a modern new distributing center at Galion, Ohio. The result . . . improved service and deliveries to steel buyers throughout the district.

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LSS-30

— New Equipment —

Continued

Heating screen cloth

A new method of heating screen cloth by electricity prevents clogging or blinding when wet materials are screened. Electrical current is carried to the screen by short insulated cables attached to copper bars which are located under the screen cloth and make direct contact with it. Current is regulated by a Hannon variable step screen cloth heater. The heated screen cloth dries out and bakes wet coal, clay, stone or other material as it tends to build up on the screen cloth wires. *Hewitt-Robins, Inc.*

For more data circle No. 37 on postcard, p. 81.

Grapples

Combining extreme lightness with unusual weight handling capacity a line of grapples has been designed to improve handling equipment at point-of-contact between crane and worker. They feature hardened steel points on the inner sides of the two arms which grip the edge of a load more tightly as the load weight increases. Nine different types of Shur-Grab grapples are being made, to handle cases of all shapes, wood and metal barrels, coils and reels, crates, rods, tubes, pipes, and other materials. *Eastern Brass & Copper Co., Inc.*

For more data circle No. 38 on postcard, p. 81.

Heavy-duty contactors

A new line of heavy-duty, single-pole, dc contactors are for use on rolling mill controls, mill auxiliaries, cranes, hoists, and related equipment. The contactor is built for long contact and arc chute life, and is designed to speed routine inspections and facilitate rapid replacement of wearing parts. Contact life is extended by a new principle of arc interruption which reduces contact burning by speeding arc extinction. To further prolong contact life, main contacts are made of heavy forged copper having high material density and uniformity. *Allis-Chalmers Mfg. Co.*

For more data circle No. 39 on postcard, p. 81.

The Iron Age

SALUTES

Robert Cass

He brings broad experience and an international background to his new job as SAE president.

MEMBERS of the Society of Automotive Engineers will have ample opportunity to become accustomed to the cultured English accents of their new president, Robert Cass.

Immediately after taking office at the January meeting of SAE, Bob faces a schedule of 43 sectional meetings from New York to Honolulu, Montreal to Dallas. In between he will sandwich in his own job of assistant to the president of White Motor Co.

In the past 18 months he has been on loan to the National Production Authority as director of the motor vehicle division. He continues as consultant to the NPA, and is a recognized authority on automotive materials supply.

Bob has an international background of varied activities. He was born in England and was educated at Crayford School and London University. He served in World War I in the Royal Naval Air Service as an aircraft engineer.

He later spent several years in the Orient as an employee of an aircraft company, then came to the U. S. to teach engineering at Harvard. He later returned to private industry, becoming chief engineer at White. He took over his present position as assistant to Robert F. Black in 1945.

Bob has been a frequent contributor to *SAE Journal* and other automotive and engineering magazines. He served as chairman of the Cleveland section of SAE in 1947-48.

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The Iron Age INTRODUCES

A. O. Thalacker, elected president, DETREX CORP., Detroit.

Grant A. Sattem, promoted to vice-president in charge of sales, LURIA ENGINEERING CO., New York.

William L. Greene, appointed vice-president—Engineering and general manager, ENGINEERING & RESEARCH CORP., Riverdale, Md.

David J. Marcus, appointed vice-president in charge of purchasing, THE STEELCRAFT MFG. CO., Rossmoyne, Ohio; and **Ben J. Sloman**, appointed assistant secretary.

Francis W. Daniels, appointed vice-president in charge of engineering, THE H. K. FERGUSON CO., Cleveland; and **Albert J. Maloney**, named manager, Cleveland district.

Kenneth G. Donald, named vice-president and treasurer, NATIONAL RESEARCH CORP., Cambridge, Mass.

Frank Scarr, promoted to assistant to the vice-president in charge of operations, KAISER STEEL CORP.

William O. Sweeney, named assistant vice-president of sales, ARWOOD PRECISION CASTING CORP., Brooklyn.

Dr. Philip R. Marvin, appointed vice-president, THE COMMONWEALTH ENGINEERING CO. of Ohio.

E. A. Duffy, appointed vice-president and general manager, and elected to the board of directors, CHANDLER-BOYD CO., Pittsburgh.

E. C. Brekelbaum, appointed director of methods, THE THEW SHOVEL CO., Lorain, Ohio.

Harold W. Lownie, Jr., appointed to a supervisory post, process metallurgy laboratories, BATTELLE MEMORIAL INSTITUTE, Columbus.

Charles W. Knowles, appointed senior vice-president, WALTER KIDDE CONSTRUCTORS, INC., New York.

Robert F. Carr, Jr., elected vice-president, DEARBORN CHEMICAL CO., Chicago.

William H. Bennett, promoted to director of engineering, THE HYDRAULIC PRESS MFG. CO., Mount Gilead, Ohio.

Phillip A. Painchaud, appointed sales engineer, CLIFFORD METAL SALES CO., Providence, R. I.

John L. Sanderson, appointed superintendent of wire mills, KEYSTONE STEEL & WIRE CO., Peoria, Ill.; and **James W. Mahannah**, promoted to assistant to the superintendent of wire mills.

Calvin D. Beck, named manager, Dayton, district sales office, ARMCO STEEL CORP.; and **Adam D. Sechrist**, named manager of tubing sales.

Whitney B. Miller, appointed manager, Louisville branch office, MOORE PRODUCTS CO.

Hugh S. Terrell, appointed assistant manager of sales, Union Drawn Steel Div., REPUBLIC STEEL CORP.

Alexander Gabay, appointed works manager, new works in Belmont, Calif., VACU-BLAST CO., INC.

James W. Murphy, appointed manager of sales, Stainless & Alloy Casting Div., Buffalo, ALLEGHENY LUDLEM STEEL CORP.

Earl R. Fiene, appointed manager, Detroit wholesale sales branch, Alemite & Instrument Div., STEWART-WARNER CORP.

Theodore V. Purvin, appointed general sales manager, AMGEARS, INC., Chicago.

SAMUEL S. AUCHINCLOSS, elected president, DeWalt Inc., subsidiary of American Machine & Foundry Co.

GEORGE SCHWARZ, named vice-president and treasurer, Wyandotte Chemicals Corp., Wyandotte, Mich.

JOHN E. OSMANSKI, named supervisor of training, Crucible Steel Co. of America.

Personnel

Continued

Henry F. Banzhaf, named to newly created post of manager of sales, control operation, Hawley Works, ALLIS-CHALMERS MFG. CO., Milwaukee.

O. B. Wilson, named industrial instruments sales manager, Industrial Div., MINNEAPOLIS-HONEYWELL REGULATOR CO., Philadelphia.

A. T. Allan, appointed manager, Brazing Product Sales, UNITED WIRE & SUPPLY CORP., Providence, R. I.

D. Pat Cromwell, appointed manager of blast furnaces and coke ovens, Rouge plant, FORD MOTOR CO., Dearborn, Mich.

Thomas H. Sheehan and **Eric G. Boehm,** have been appointed to the newly created positions of assistant managers of manufacturing, HOUDAILLE-HERSHEY CORP., Detroit.

J. Robert Jones, named sales manager for standard machine sales, KEARNEY & TRECKER CORP., Milwaukee.

G. J. Doss, named general manager, new E. P. Switchboard & Control Div., THE ELECTRIC PRODUCTS CO., Cleveland.

J. M. Cosgrove, appointed newly created position of manager, tin plate sales, KAISER STEEL CORP., Oakland, Calif.

Karl D. Klein, appointed general sales manager, BOWSER TECHNICAL REFRIGERATION, Terryville, Conn.

J. L. Mealy, named sales manager, direct application, rock phosphates, INTERNATIONAL MINERALS & CHEMICAL CORP., Chicago.

Ralph N. Fitzpatrick, appointed district manager, Cleveland, Electro Metallurgical Co., a division of UNION CARBIDE & CARBON CORP.

M. F. Meissner, appointed general manager, Metal Div., OLIN INDUSTRIES, INC., East Alton, Ill. He succeeds **Marshall W. Acker,** who continues as Olin president and director.

LOGAN T. JOHNSTON, elected vice-president in charge of sales, Armco Steel Corp.

FRANCIS ST. CLAIR O'LEARY, appointed assistant to the vice-president, Industrial Relations, Pittsburgh Steel Co.

WILLIAM J. AHLFELD, appointed assistant director of public relations, Chicago, U. S. Steel Corp.

PAUL GARMUS, promoted to field engineer, The Timken Roller Bearing Co. Canton, Ohio.

SEND FOR 248-PAGE
WILMOT CHAIN & CONVEYOR Catalog
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"Uneven" Sheets Cause of Press Plant Trouble, *Says Trade Paper**

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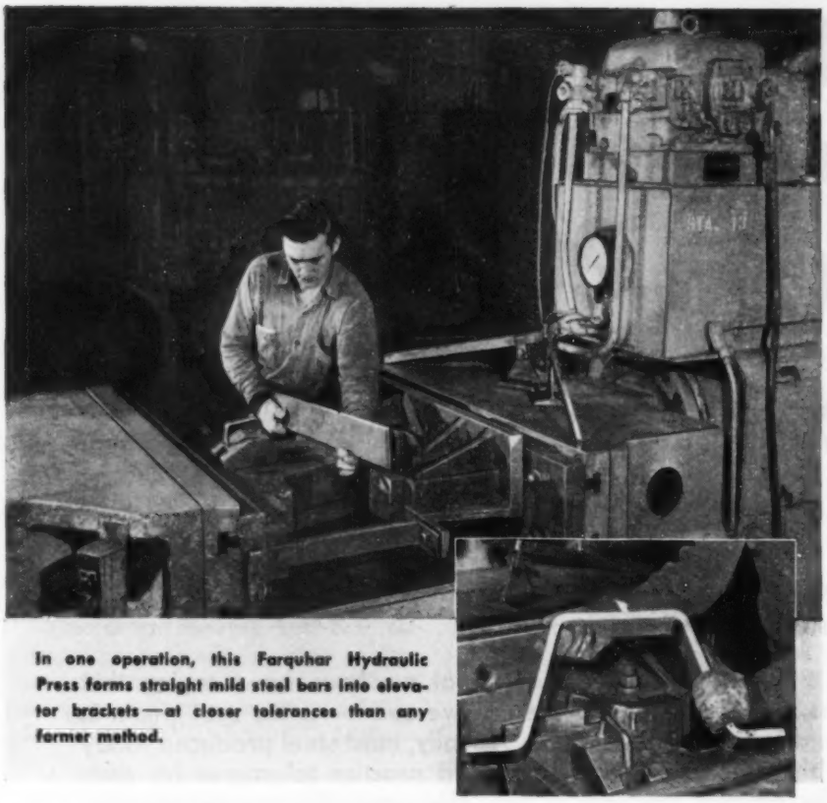

In one operation, this Farquhar Hydraulic Press forms straight mild steel bars into elevator brackets—at closer tolerances than any former method.

OTIS ELEVATOR COMPANY *boosts production, slashes time and labor costs in half, with this*

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In forming lengths of mild steel, the Otis Elevator Company, world's largest elevator and escalator manufacturer, would heat steel and bend it while it was hot. Trying to improve on this system, Otis Production Engineers developed a cold bending process. Farquhar Engineers were contacted, and a 250 Ton "Bulldozer" Horizontal Press was recommended and installed. By bending the steel bars cold in the Bulldozer, Otis has effected a 50% increase in production alone! Time and labor costs have been reduced an estimated 33⅓%! In addition, the Bulldozer operates at closer tolerances than the old heat and bend method. All this, 8 hours a day, 5 days a week, with maintenance costs that Otis terms "negligible."

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—Personnel—

Continued

Bruno R. Mueller, appointed sales manager, Tubular Specialties, PITTSBURGH STEEL CO., Pittsburgh; **A. S. Gardner,** appointed assistant to the general manager of sales; **Rudolph F. Schlentner,** appointed assistant district sales manager, Pittsburgh district sales office; and **Richard D. Jenkinson, Jr.,** appointed assistant product manager, sheet sales, Sales Dept.

John R. Hersey, appointed assistant sales manager, THE C. O. BARTLETT & SNOW CO., Cleveland.

Gilbert B. Devey, appointed to application engineering staff, SPRAGUE ELECTRIC CO., North Adams, Mass.

Walter Hasenzahl, Jr., appointed general manager of manufacturing, TRAILMOBILE INC., Cincinnati.

D. Russell Pearce, appointed assistant purchasing agent, Machinery Div., DRAVO CORP., Pittsburgh; and Robert Dickey, named assistant to the sales manager, Engineering Works Div.

Edwin S. Dojka, named draftsman in the Engineering Dept., HOOKER ELECTROCHEMICAL CO.; and **Jerold Perreault,** becomes chemical engineer in process study.

Frank R. Reynolds, appointed sales manager, Furnace Processing Div., WALL COLMONOY CORP., Detroit.

OBITUARIES

Carl D. Fischer, Jr., 71, president and general manager, The Wapakoneta Machine Co., recently at his home in Wapakoneta, Ohio, after a 2-year illness.

B. S. Cain, 53, one of General Electric's top locomotive design engineers, and assistant manager of locomotive engineering, Locomotive & Car Equipt. Dept., Erie, Pa., of a heart attack.

George William Abel, 64, general superintendent, steel plant at Indiana Harbor Works, East Chicago, Ind., of The Youngstown Sheet & Tube Co., of a heart attack.

Harold J. B. Thompson, 57, manager of real estate, Lukens Steel Co., in Chester County Hospital, West Chester, Pa., after a long illness.

The Iron Age
FOUNDED 1855
Technical Articles

Plastics: MACHINERY MARKET BOOMS

First of a Series

Steel and equipment markets . . . Growth of plastics and metals compared.

By H. R. Simonds
Consulting Engineer
New York

Much large and small machinery of varied types is used in the production of plastics. One pound of machinery is required for every 10.4 lb of plastic produced. This rapidly expanding industry is one of the best new customers of the metals industry. About 90 pct of the metal used to build the machines is steel.

♦ THE PLASTICS INDUSTRY, often considered a developing threat to the steel industry, is actually one of its important customers. To produce the 2,500,000,000 lb of plastics sold in the United States in 1952 required the use of at least 600,000 tons of metal, mostly steel, in the form of equipment. The relatively recent advent of plastics has also helped in the development of new uses of metals, totaling many times the amount used in equipment. Hundreds of products in every day use illustrate the successful combining of plastics and metals and the interdependence of one material on the other. The ubiquitous telephone handset is a good example of where the dielectric properties of plastics combine with the strength of metals to produce a compact unit, not otherwise possible.

Herbert R. Simonds, author of this series of articles is a consulting engineer specializing in plastics. He is author or co-author of various books on plastics, including, "Handbook of Plastics." He was formerly on the editorial staff of IRON AGE and is now President of Hallmark Institute, Inc., New York City, a consulting firm.

This series will be devoted to a description of the variety of equipment required to make the surprising variety of products of the broad and expanding plastics industry. In many respects the steel industry and the plastics industry are about 25 years apart in development. The steel industry in 1902 was in about the same situation as the plastics industry in 1927. The growth of the steel industry during the 20 years succeeding 1902 is compared to the growth of the plastics industry succeeding 1927 in Table I.

The comparison in growth is shown in the graphs. The lower graph for plastics starts in 1927 and the upper tabulation for steel starts in 1902. Growth is shown in millions of pounds but the vertical scale is broken to make it possible to get both graphs on the same page.

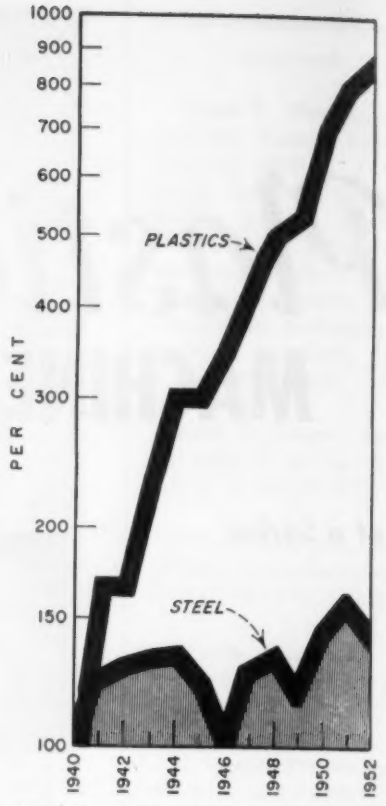
Each of the eight sections of the plastics industry listed in Table II has many subdivisions. Fabricating includes the rapidly developing process of heat sealing which calls for interesting equipment. Also, extrusion includes the making of fibers and filaments. In order to describe equipment, it is necessary to cover briefly the manufacturing processes involved.

Plastics originate as a part of the chemical

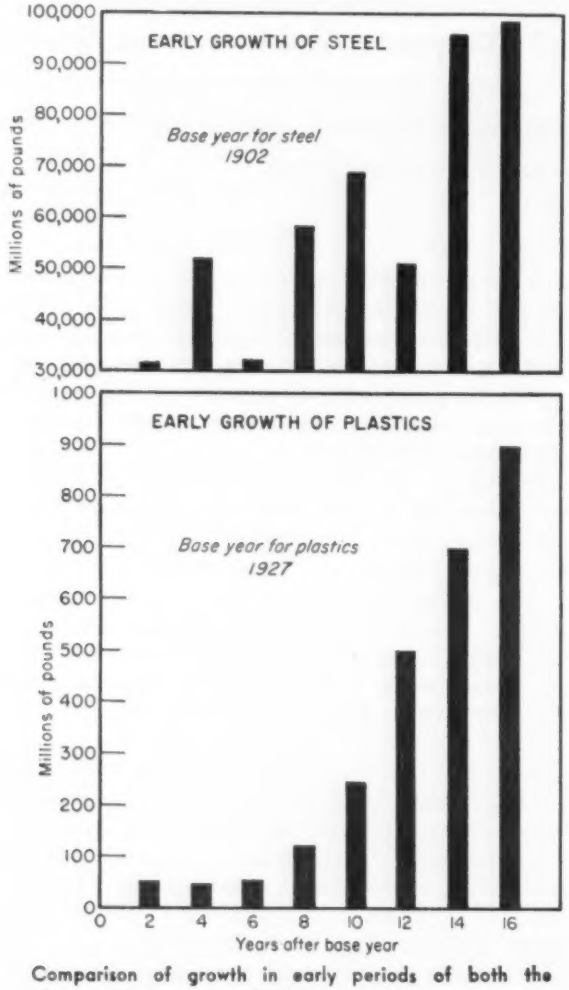
industry and thus in describing equipment for plastics, it is difficult to set any clear-cut starting point. The phenolics, for instance, are made from phenol and formaldehyde, but these in turn may be made from benzene and methanol, and while these chemical processes and the elaborate equipment involved seem a part of the plastics industry, they perhaps more truly belong to the chemical industry.

Accordingly, this series arbitrarily starts with raw materials at the resin or raw plastics plant and describes the equipment required for the initial compounding and then for most of the succeeding operations until the finished product is reached.

Processing of plastics through the succeeding operations are numerous. The same material, for example polystyrene molding powder, may follow a short path such as molding, tumbling, packing, shipping, or a long path such as coloring, blending, extruding, sheeting, winding, slitting, embossing, cutting, heat sealing, packing, shipping. In the first instance, the cost of equipment may be $100 for an annual production of 1000 lb of finished plastics and the metal used may be mostly carbon steel. In the second case, the equipment needed may cost $300 for the same annual production and the metal may be mostly alloy steel. These approximate figures are exclusive of the equipment needed to make the molding powder.



BOTH STEEL AND PLASTICS have bounced upward since 1940. Plastics production soared 765 pct in that time.



Comparison of growth in early periods of both the plastic and the steel industries.

The trend in the plastics industry is very definitely toward the use of more and more automatic machinery, the use of more alloy steel, more monel metal, more electronic devices. Air conditioning is now a necessity in a plant blending light-colored molding powder. It is also a "must" in many specialized industries which may or may not be included as part of the overall plastics picture. One such specialized operation is the coating of cellulose-acetate photographic film where the utmost pains are taken to create a dust-proof atmosphere.

Designers of plastics equipment in general are more concerned with the effect of metal on plastics, with resistance to corrosion and to elevated temperatures than with strength of materials. Nickel and nickel-clad steel may be used to resist action of caustic solutions, tantalum and rubber-covered steel to resist hydrochloric acid, Duriron to resist nitric acid and asbestos-filled phenolic plastics to resist dilute acids.

Occasionally need is found for a metal with moderate strength and resistance to both abrasion and high temperature. One such need is for the cylinder linings for plastics-extrusion machines and an alloy produced on the Pacific Coast has met these conditions so well that a majority of the builders of extruders in the east

TABLE I

GROWTH DURING EARLY YEARS COMPARING TWO PERIODS IN STEEL AND PLASTICS

Production of Steel Ingots and Castings

Year	Year on Horizontal Scale in Fig. 1	Million Pounds
1902	0	33,600
1904	2	31,360
1906	4	51,520
1908	6	31,360
1910	8	58,240
1912	10	69,440
1914	12	51,520
1916	14	96,321
1918	16	98,560

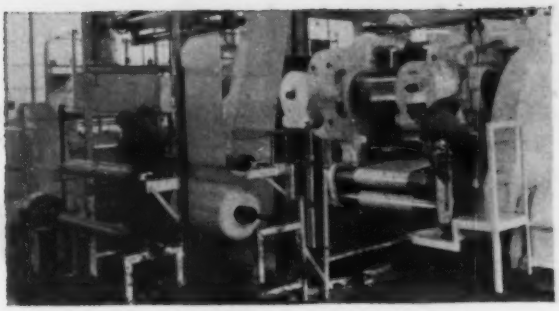
Plastics Production

Year	Year on Horizontal Scale in Fig. 1	Million Pounds
1927	0	37
1929	2	56
1931	4	50
1933	6	57
1935	8	115
1937	10	250
1939	12	500
1941	14	700
1943	16	900

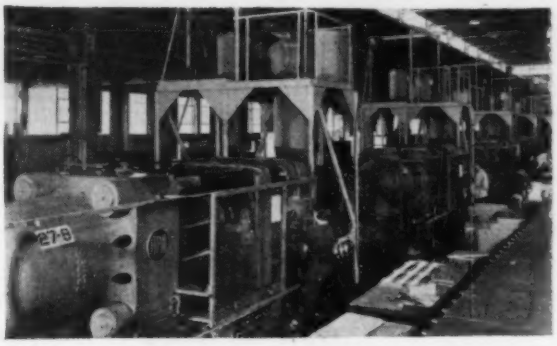
TABLE II

SECTIONS OF PLASTICS INDUSTRY

1. Manufacture of base resins
2. Compounding of molding powders and of extrusion compounds
3. Molding
4. Extruding
5. Forming of reinforced plastics and laminates
6. Calendering
7. Casting
8. Fabricating



Typical machinery in the modern plastic plant of Texileather Corp. The machine in the center is a 24 x 66 in. 4-roll plastic calender manufactured by the Farrel-Birmingham Co.



Largest production line for molding large plastic parts is located at General American Transportation Corp., East Chicago, Ind. These hydraulic presses turn out television windows, refrigerator door panels and similar large sized parts.

use liners which have been built in California.

The non-industrial trend in plastics is for more colors and for lighter colors and this new demand is at once reflected in the design of equipment. Pastel shades in ureas, for instance, are apt to be discolored by even small amounts of iron, so designers turn to monel metal for some of the urea-handling equipment, also individual-pressurized rooms and color-matching machines are often required.

In addition to the trend toward automatic machines in all branches of plastics production, there is an urgent demand for faster cycles and for larger capacities. Changes in the general character of plastics processing also are taking place as new materials and new methods are developed. Sales of extrusion machines are increasing more rapidly than are sales of molding presses. Presses for reinforced plastics are in increasing demand as are heat-sealing and pre-forming machines, both now widely used.

A set of rolls for heating and working plastics may cost $50,000 and weigh 50,000 lb. This price of $1 per lb for equipment is above the average but some machines cost more than $1 per lb and the average equipment price per pound is close to the per pound price of the plastics which are produced.

The total weight of metals represented in the equipment required to keep the plastics industry operating and expanding is estimated at more than 600,000 tons which at 10 pct depreciation and 10 pct expansion of the industry means sales to the plastics industry of 120,000 tons of metals a year, or 1 lb of metal equipment for every 10.4 lb of plastics. This is in addition to the metal used for molds and to that represented by the depreciation of the machine tools in the plants of plastics equipment manufacturers.

A SERIES ON MACHINERY FOR PLASTIC PRODUCTION

This is the first of a series of articles describing equipment used in the plastics industry. Steel dies, used in custom molding of plastics represent an annual outlay of $20 million. The second article in this series will start with plastics production and will describe equipment used in that branch of the chemical industry devoted chiefly to the manufacture of resins. The later articles, which will appear from time to time in this series, will describe equipment used in the various succeeding plastics operations, such as compounding of powders and subsequent molding, and the calendering of films and sheeting used in many industries.

Waves bounce back—

Ultrasonic testing used for SMALL-DIAMETER TUBING

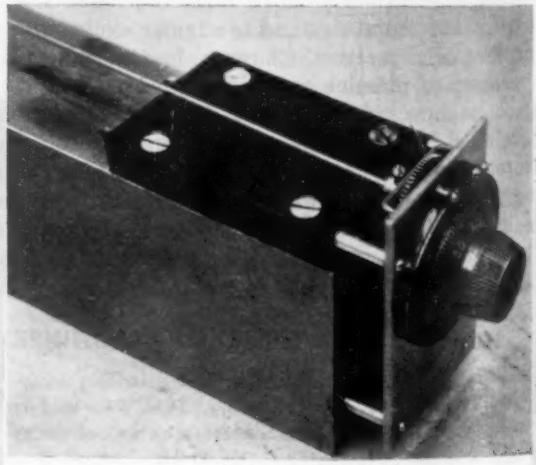
By Andrew J. Pardus
Knolls Atomic Power Laboratory
General Electric Co.
Schenectady

Procedures and equipment have been developed by which ultrasonics can be applied successfully to locate flaws in small-diameter tubing. High-frequency pulsating sound waves sent into the tubing locate flaws by reflecting from the defect. Any discontinuity reflects the sound waves back to a searching unit which presents them on a reflectoscope. With thin-wall tubing, a shear wave is generated by an angle quartz crystal and sent angularly into the tubing. Best results are obtained with a 1-megacycle, 1-in. quartz crystal, angle searching unit.

◆ PIPES OF 1½-IN. DIAM and greater have been tested successfully by using shear waves generated perpendicular to the longitudinal axis. This method is impracticable for smaller tubing due to the period of blanking of the receiver at the instant of pulse transmission. The blanking lasts for about 150 microseconds and completely cancels any reflection from the first 1½ in. of material.

Other present methods of testing small-

TESTING SETUP for detecting defects in small-diameter tubing consists of a Sperry Reflectoscope, searching unit and a holder in which tubing can be rotated.



CLOSE-UP of holder and gear arrangement which rotates the tubing slowly and steadily when knob is turned.

diameter tubing also have limitations. A mass-spectrometer-type leak detector will find very minute leaks in small-diameter tubing. Bubble testing will detect large leaks. However, neither method is effective unless the defect extends through the entire wall thickness. Radiographic inspection and hydrostatic pressure testing were not entirely satisfactory for detecting and measuring defects.

The Nondestructive Test Group at General Electric's Knolls Atomic Power Laboratory investigated the use of ultrasonic waves for testing small-diameter tubing. The results showed that such testing is feasible when the shear wave is parallel to the longitudinal axis of the tubing.

A standard model Sperry Reflectoscope was used for the test. One of its circuits is a pulse transmitter which sends out a short, high-frequency electric pulse at a low repetition rate to a searching unit and an amplifier. The searching unit receives these electrical pulses through a coaxial cable and transforms them into mechanical vibrations by means of a piezo-electric quartz crystal. It then transmits them into the material being tested.

The searching unit is also acted upon by the mechanical vibrations reflected from the material. It transforms these back into electrical pulses which are delivered to the amplifier through the coaxial cable. The pulses are then amplified and applied to the vertical deflection plates of a cathode-ray tube. The plates, in turn, deflect the electron beam of the cathode-ray tube and cause it to trace out a vertical indication of the initial pulse sent out and of all reflections received by the searching unit.

The power supply of the reflectoscope furnishes the voltages necessary to operate the electronic tubes and the electron gun of the cathode-ray tube to form the electron beam. A sweep circuit energizes the horizontal deflection plates of the cathode-ray tube to create the sweep of the electron beam. A synchronizer acts to properly time the operating cycle. It also triggers the marker-circuit which energizes the vertical deflection plate of the cathode-ray tube to form the pips used to measure distance units between indications.

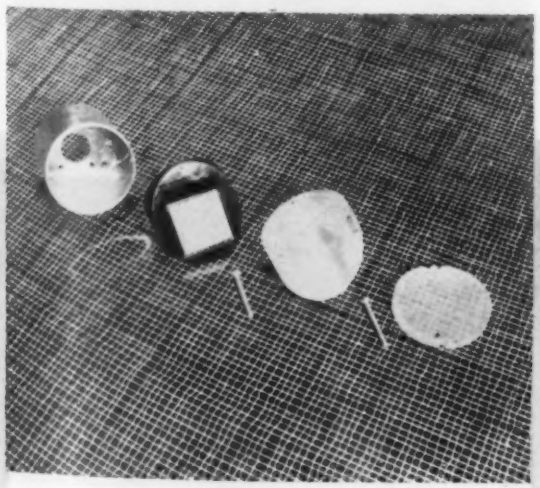
A holder for the small-diameter tubing was made with a gear arrangement to rotate the tube steadily and slowly. It measures 3 x 2 x 24 in. and has the gear assembly attached and aligned perpendicular to the length of the holder.

Two pieces of Textolite were grooved to a 0.035-in. depth and a 0.040-in. radius. These were fitted squarely at each end of the steel block of the holder to cradle the tubing. The Textolite pieces replace a single piece which extended the full length of the tubing and limit the damping which previously occurred. An improvement in sensitivity was observed due to better sound transmission.

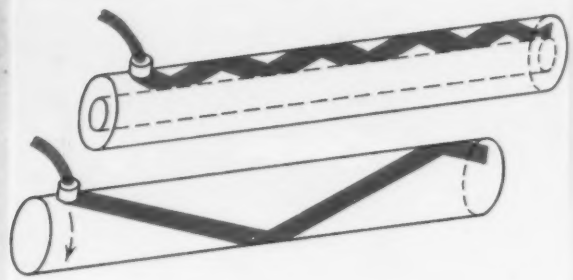
The standard 1-megacycle angle searching unit was modified by cutting 5/32 in. from the face of an angle Plexiglas wedge. This was done to include a ¼-in. Plexiglas shoe having a groove with a 0.035 to 0.040-in. radius along the diameter. The shoe has a bevelled edge on the side opposite the groove. This bevel limits the rotational orientation of the shoe with respect to the holder. The angle Plexiglas wedge and an angle Bakelite crystal backing are coupled with SAE No. 20 lubricant oil.

The Plexiglas shoe can be rotated slightly either clockwise or counter-clockwise on the surface of the Plexiglas wedge. This permits the tubing to be oriented to the quartz crystal for maximum transmission of sonic energy. If the Plexiglas shoe is rotated beyond the breaking point of the oil seal, poor transmission results.

Other angle seaching units and different de-



MAJOR COMPONENTS of the angle searching unit, left to right, are housing, crystal attached to backing, wedge, and shoe. This unit gave best results.

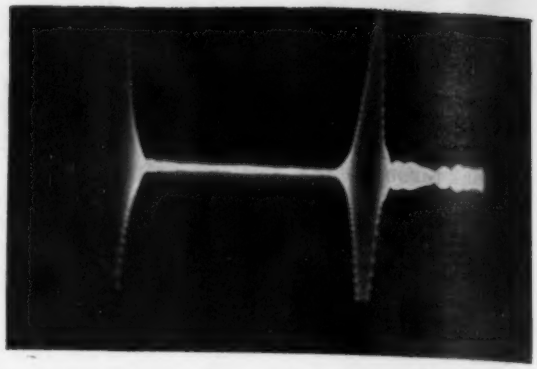


PATH OF ELECTRON BEAM is shown in tubing and bar stock. Sound waves locate flaws by reflecting from defect.

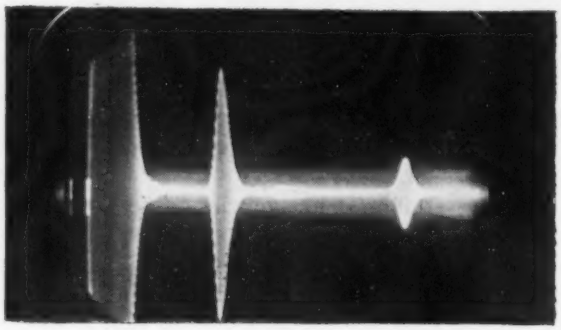
"By moving the searching unit longitudinally ½ in. or less, the entire tube was inspected."

signs of Plexiglas shoes were tried. The best results were obtained with the 1-megacycle, 1-in. quartz crystal, angle searching unit. Higher frequency crystals of 2¼ and 5 megacycles were tried but were unsuccessful due to high attenuation of the sonic energy.

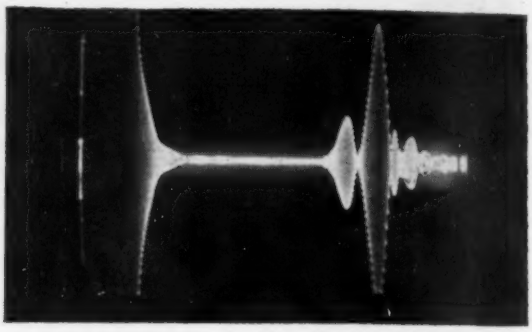
During the investigation, reflectograms were made on various sizes of notches, small holes and grooves. Circumferential notches were cut



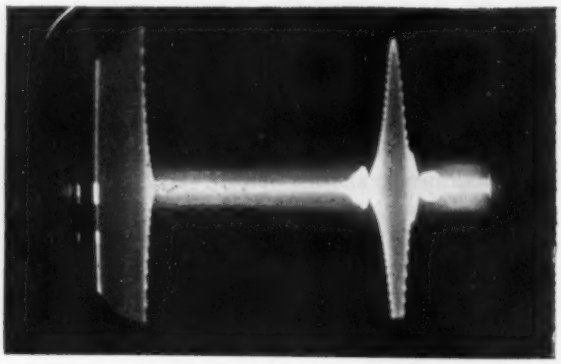
REFLECTOGRAM of tubing shows no defects. Peaks are of initial pulse (left) and back reflection (right).



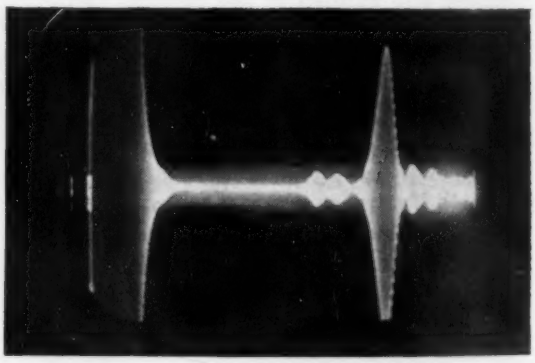
SOLID STEEL ROD of 0.080-in. diam shows no defects in reflectogram. From left to right are initial pulse, first and second orders of back reflections. Better sound transmission is obtained with solid bars.



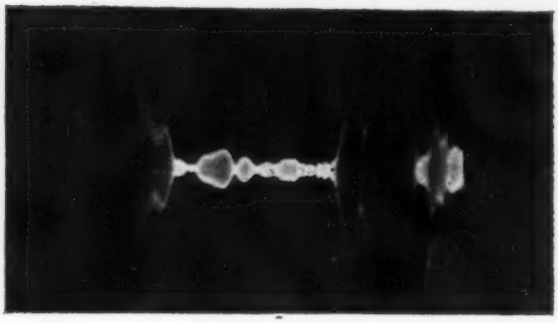
FILE MARKING about 0.005 in. deep, 2 in. from end of tube and 40° circumferentially is indicated on screen. Middle defect indication is 33 pct of back reflection.



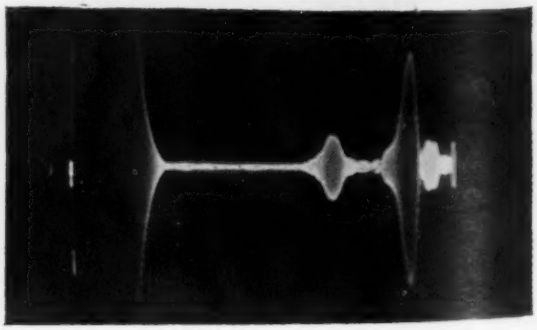
DEFECT INDICATION is that of notch 0.002 in. deep, 2 in. from end of tube, 1/32 in. wide and 180° circumferentially. Second indication from the left shows that the defect is 17 pct of back reflection.



TWO NOTCHES made circumferentially 3 and 4 in. from end of tube, 0.002 and 0.001 in. deep, respectively, are indicated in reflectogram. Second and third indications show defects side by side.



AXIAL GROOVE in tubing is indicated by second largest peak from left. The groove is about 0.005 in. deep, ¼ in. long and 2 in. from opposite end of tube.



SINGLE HOLE made 4 in. from end of tubing with a No. 80 drill through 0.010-in. wall. Second indication from left shows defect is 30 pct of back reflection.

with a grinding disk while the tubing was rotated in a lathe. Axial grooves were made with a special tool in a milling machine. The tubing had a 0.060-in. ID, 0.080-in. OD and an average length of 24 in.

The tubing was rotated in the holder with the searching unit placed at one end, directing the electron beam to the opposite end. By moving the searching unit longitudinally ½ in. or less, the entire length of the tube was inspected.

Size of the defects in a given number of the same type tubes was measured and compared with a standard calibrated notch on similar tubing. The 0.001-in. calibrated notch was made about 4 to 8 in. from one end of a standard tube. Closer placement to the end would cause end reflection to interfere with interpretation of the calibration. A defect at or near the tube end would be shown on the reflectoscope screen at a tangent to or on top of the back reflection. Pressure damping was applied at the end of the tubing to separate the indication from the back reflection.

Adjustment of the reflectoscope for maximum sensitivity was not required to obtain good results in the interpretation of defects of small size. Sensitivity for each reflectogram was increased just enough to give a vertical back reflection indication equal to the height of the screen. By this method, defect indications in the reflectograms were comparable to the back reflection. A larger indication of the defect was made visible by increasing sensitivity, but the increase in defect indication was directly proportional to the increase in noises and back deflection.

NEW BOOKS

"The Craft of the Metal Worker," by R. S. Duddle. Contains a simple explanation, with adequate drawings, of many metalworking procedures. Gives some historical background. Does not cover machinery or machine operations. Anglobooks, 475 Fifth Ave., New York 17. $4.00. 160 p.

"Conciliation In Action," by Edward Peters. A statement of the principles of conciliation intended as a working manual in labor relations. The National Foremen's Institute, Inc., New London, Conn. $4.50. 266 p.

"Iron and Steel Works of the World." Edited by H. G. Cordero. A listing of the major iron and steel plants in the world. More than 1000 plants in over 50 countries on five continents are included. Location of plant, capacities, products, output, capital, directors are included. Quin Press, Ltd., Birkett House, 27 Albermarle St., London, W. 1. $7.00. 651 p.

"Weight-Strength Analysis of Aircraft Structures," by F. R. Shanley. Sound methods of analyzing and predicting the structural weight of aircraft and missiles are presented. Methods by which the minimum weight can be determined for any material and any condition of loading are suggested. These principles of design for minimum weight are then used to derive weight equations for wing and fuselage structures. McGraw-Hill Book Co. Inc., 330 West 42nd St., New York 36, N. Y. $8.50. 394 p.

"The World of Eli Whitney," by Jeannette Mirsky and Allan Nevins. For too long Whitney has been remembered as the man who invented the cotton-gin. He was much more. An idea-man, he developed standard interchangeable parts for the musket, invented specific tools, pioneered in manufacturing processes and in the use of unskilled labor. His was an important contribution to the Industrial Revolution in America. Based on hitherto unpublished family papers. The MacMillan Co., 60 Fifth Ave., New York 11. $5.75. 346 p.

"Encyclopedia of Surface-Active Agents," by J. P. Sisley and P. J. Wood. General aspects of surface-active agents, their properties, applications, and methods of manufacture. A system of classification is developed by which such agents can be identified by simple symbols. Includes a compilation of data on all major commercially available agents. The Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. $15.00. 540 p.

"Handbook of Manual Materials Handling Equipment." This publication of the Caster and Floor Truck Mfrs'. Assn. can be used as an effective idea book in meeting some primary materials handling problems. Industrial wheels, casters, 2-wheel hand trucks, industrial platform trucks and trailers, and pallets and skids are pictured and described. Caster and Floor Truck Mfrs.' Assn., 27 East Monroe St., Chicago 3. $1.00. 48 p.

"Apprenticeship—Past and Present." About 150,000 employers are taking part in apprentice training programs. An interesting booklet. Contrasts apprentice training programs of today and yesterday. Supt. of Documents, Government Printing Office, Washington 25, D. C. 15¢.

Less paperwork—

Discovery Sampling Cuts Costs in Quality Control

By James R. Crawford
Manager
Inspection Technical Services Dept.
Lockheed Aircraft Corp.
Burbank, Calif.

Discovery sampling, a simplified quality control system, may hold the key to lower inspection costs in your plant. It especially meets the needs of the job shop with a large volume of small orders entering production each month. Records are simple and have been kept to a minimum. The method indicates a level of quality within an individual production area. It may also be applied to purchased parts in stores.

◆ CONFRONTING EVERY JOB SHOP doing aircraft work and the airframe industry is the cost of using or installing a quality control program. Application of conventional plans to a large variety of short runs creates a volume of records out of proportion to the economic gain these plans can give. Discovery sampling is a simple plan the inspector can use to yield a quality level that can be specified. It satisfies the statistician, production and inspection departments, and management.

Applied to the job, ten parts are selected at random and inspected. If no defects are found, the lot is accepted. If one or more defects are found, the lot is dispositioned as discrepant material. That is the statistical part of the plant from the point of view of the inspectors. It yields theoretically an average of less than ½ of 1 pct discrepant material in the stockroom.

Any sampling plan involves a risk of accepting discrepant material. The statistical problem is to measure this risk and express it in numbers. There are two kinds of risks: (1) The chance of accepting a single lot with the fraction defective p; (2) The tolerable average fraction defective for all lots accepted.

What is the chance of accepting a lot 10 pct or 20 pct discrepant, etc.? This information, important to the inspection supervisor, is presented as an operating characteristic or OC curve. Formula for the OC curve is $Pa = (1-p)^n$ where n is the sample size and p the fraction or per cent defective. These OC curves are given in texts on quality control and sampling, and in MIL-STD 105A, the Military Standard Sampling Procedures and Tables for Inspection by Attributes.

An OC curve states that for a sample size of 10 a lot 10 pct discrepant will be accepted 35 pct of the time. A 20 pct discrepant lot will be accepted 10 pct of the time. The curve doesn't say how frequently a 10 pct defective lot occurs. Single, double, and sequential sampling plans require a process average on every part to give a measure of the probability of occurrence of lots containing discrepant material.

This is satisfactory for a plant making long runs on a few standardized items, but aircraft production requires more than 100,000 different parts per model, with runs from 30 to 300 units per lot, and the same part number may be introduced to production as often as once every month. Record maintenance alone eliminates the advantage of sampling as compared with 100 pct inspection.

Here discovery sampling introduces a new concept. A particular area such as the sheet-metal department is considered statistically as a single process. Parts are of different shape, but they are made by a crew of men on similar

machinery and have common characteristics. Each lot of different parts constitutes a sample of this process. Statistically, this is acceptable and the average number of discrepant lots from a given area is a measure of the quality level within the area.

Lots neither wholly good nor wholly bad contain a fraction of defectives, p. A study of the frequency of occurrence of lots by fraction defective p showed lots with 0 to 5 pct defective occurred more frequently than lots with 50 to 99 pct defective.

From a plotting of the data the following conclusion was reached. While the scatter or dispersion of the data was quite wide a curve of the type $(1-p)^s$ was evident. This is the same as the OC curve where sample size is s. The value found for s was 3 and the result is the same as if the certain group of production workers that produce partially defective lots actually look at 3 parts per lot or order.

Applied in receiving inspection

The same characteristic was evident in receiving inspection where parts come from hundreds of vendors. The important fact is that the frequency density function for partially defective lots is determinable. This function is used in the mathematical analysis. For simplicity, its effect is maximized and the factor dropped from the final relationship.

In developing a formula for the fraction of defective material in stock, the following symbols were used. A = fraction (percentage) lots partially defective, defined as: A = partially defective lots ÷ partially defective lots + 100 pct good lots; n is the number of parts per lot inspected; k is the fraction of discrepant material in stock. The formula developed is:

$$k = \frac{A}{4n + 2}$$

The formula for the fraction of discrepant material in stock indicates how many parts per lot should be in the sample. Thus, if 8 pct of the lots in a production area are partially defective, and the inspector looks at 10 parts per lot, then A = 0.08, and n = 10. Then, using the formula,

$$k = \frac{0.08}{4 \times 10 + 2} = 0.0019$$

This is the limit the fraction defective for material in stock can reach under the plan and for conditions specified. A chart by week for the percentage of partially defective lots constitutes the only necessary record and provides the value for A.

In areas like the punch press department where the fraction of partially defective lots is extremely low a sample size of 2 would be sufficient. For consistency, a standard sample size of 10 has been adopted for all production departments.

As lot size decreases, sample size necessary for a given degree of assurance should also decrease. To be convinced, it is only necessary to take the case where a lot size of 10 exists and the sample size is 10. This is 100 pct inspection and yields a greater theoretical assurance than any sampling plan.

In functional testing where one test may take as long as 15 min, the saving provided by small lot sampling is highly desirable.

A small lot L may be considered as a kind of a sample from a large lot with a fraction defective p. From chance causes this small lot will contain 0, 1, 2 . . . or L defects. If these small lots are sampled by the inspector to the extent r, the quality assurance that results can be expressed. The previous discussion of discovery sampling led to an expression for quality assurance that results when a large lot is sampled to the extent n when these two expressions are equated.

The result relates the sample size for a small lot L to the sample n for the large lot. The equation is:

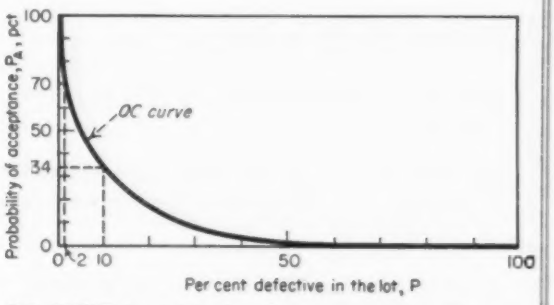
$$\frac{L-r}{L(r+s+1)(r+s+2)} = \frac{1}{(n+s+1)(n+s+2)}$$

TABLE I

SIZE FOR SMALL LOTS

Reduced Sample (r)	Related Lot Size for Equal Assurance (s = 3)*
1	1
2	2-3
3	4-5
4	6-7
5	8-10
6	11-15
7	16-23
8	24-43
9	44-140
10	140 and up

Tables relating L and r for any desired set of values assigned for n and s may be computed from the formula.
*n = 10 c = 0 for large lots.



OC CURVE for 1-3-1 plan shows acceptance with varying percentages of parts defective.

Discovery sampling may be applied to purchased items not inspected until release to production . . .

If a sample of n = 10 with no defects allowed is satisfactory for a large lot and the value of s = 3 is assigned, reflecting experience with distribution of partially defective lots, the size for the small lots related to a reduced sample r is given in Table I.

If a defect is found in the reduced sample r for the small lot L, the lot is inspected 100 pct and the count of defects kept. If, for a lot of size L, defects exceed the number D in Table II, there is 90 pct assurance that the large lot from which the small lot was taken is more than 10 pct defective and a stock check is made.

Many purchased instruments and functional items, like fuel pumps, are stocked without inspection because of problems related to preservation. They are tested as released to production. Each such small lot is from the large lot in stores and if the small lot indicates that the large lot may be more than 10 pct defective it is desirable to check stores. See Table III.

Up to this point we have discussed discovery sampling by *attributes*, i.e., without reference to the *degree* of goodness or badness of a part. The measurable degree of a good or bad characteristic of a part is a variable. This information can be used to further reduce the amount of sampling necessary to achieve a desired degree of quality assurance.

The process for getting this extra assurance is simply illustrated. Five parts are selected at random from a lot and arranged in order of size. The part dimension is 1-in. with a tolerance ± of 0.010-in.

		Dimension in in.
Upper Limit of Tolerance		1.010
Sample Order	1	1.006
	2	1.002
	3	1.001
	4	0.998
	5	0.993
Lower Limit of Tolerance		0.990

If the largest or smallest value exceeds the tolerance hold the lot for disposition. Otherwise, discard the highest and lowest measurements, i.e., 1.006 and 0.993 in., and difference the remaining extreme measurements. Thus, the difference between

Sample two,	1.002
Sample four,	0.998
Difference	0.004

Subtract this difference, 0.004, from the smallest remaining measurement, 0.998 for sample four, yielding 0.994. If this number is greater than the lower tolerance, accept the lot as being above the minimum.

Next, add the same 0.004 difference to the largest remaining measurement, 1.002, yielding 1.006. If this number is less than the upper tolerance, accept the lot as being below the upper tolerance. If either of the above numbers exceeds the related tolerance, the lot is held for disposition.

This 1-3-1 plan excludes the extremes of a sample of five and works with the extremes of the middle three measurements. A 2-6-2 plan excludes the two largest and the two smallest measurements in a sample of 10 and works with the extremes of the middle six measurements.

Such a plan has a determinable OC curve such as the OC curve shown for the 1-3-1 plan. This tells what the plan will do. If the lot is

HERE ARE STEPS IN DISCOVERY SAMPLING

Inspection supervisor authorizes parts for inspection.

Characteristics needing 100 pct inspection are listed. If no approval exists, 100 pct inspection is assumed.

Only parts inspected are stamped.

When part number is marked on part, lot number is included.

Shop order carries inspector's stamp and word SAMPLED if sampling is used. Shop order is the permanent record for tracing discrepant material.

A weekly record of disposition of lots presented for inspection is kept for each area. Part number is recorded as incomplete, accepted, partially discrepant, or 100 pct discrepant. If the lot was sampled the letter S is noted.

Record is summarized and charted for each production department showing the percentage of lots in each category. This gives a satisfactory record for administrative control and meets statistical requirements.

Inspector stamps parts, shop orders, and inspection tags. No weekly record is kept of the quantity of lots or parts inspected by individual inspectors. Work samplings or ratio delay techniques are more satisfactory.

Where characteristics such as hardness, flaws or thickness of sheetmetal require additional protection, 25 parts per lot are inspected. If a sample of 25 will not give sufficient protection, then 100 pct inspection is required.

TABLE II

DEFECTS V. LOT SIZE*

(L) Small Lot Size	(D) Critical Number of Defects
1 to 2	0
3 to 8	1
9 to 14	2
15 to 21	3
22 to 28	4
29 to 36	5
37 to 43	6
44 to 51	7
52 to 58	8
59 to 66	9
67 to 74	10
75 to 82	11
83 to 90	12
91 to 99	13
100 to 107	14
108 to 116	15

* If the critical number of defects is exceeded for the related lot size, there is 90 pct assurance that the parent lot is more than 10 pct defective.

2 pct defective the plan will accept the lot 70 pct of the time. If the lot is 10 pct defective the plan will accept the lot 34 pct of the time.

The 1-3-1 plan for variables is approximately equal the attribute plan for sample size of 10 and acceptance number 0. As the size of the sample increases the saving from the variable plan also becomes greater. The OC curve for discovery sampling by variables when multiplied by the probability density function $(1+s)(1+p)^s$ and summed for all values of p will give a value k for the fraction of discrepant material in stock.

No simple formula exists for this final end result but the value for k can be derived by rational approximation. Formulas for individual points on the OC curves exist for all possible combinations of the application of truncated ranges to sampling by variables.

TABLE III

FRACTION DEFECTIVE UNKNOWN

r \ n	S	10	15	20	25	30
1	1	1	1	1	1	1
2	2-3	2	2	2	2	2
3	4-8	3-4	3	3	3	3
4	9-30	5-6	4-5	4	4	4
5	Over 30	7-8	6	5-6	5	5
6		9-12	7-8	7	6-7	6
7		13-19	9-10	8-9	8	7-8
8		20-34	11-13	10	9	9
9		35-111	14-17	11-12	10-11	10
10		Over 111	18-22	13-15	12-13	11-12
11			23-30	16-18	14-16	13
12			31-44	19-21	16-17	14-15
13			45-77	22-26	18-19	16-17
14			78-242	27-32	20-22	18-19
15			Over 242	33-41	23-26	20-21
16				42-55	27-30	22-24
17				56-79	31-36	25-27
18				80-137	37-42	28-30
19				138-423	43-52	31-5
20				Over 423	53-65	36-40
21					66-87	41-46
22					88-125	47-53
23					126-213	54-63
24					214-655	64-76
25					Over 655	77-96
26						97-126
27						127-180
28						181-306
29						307-936
30						Over 936

S = 0, fraction defective unknown.
r = reduced sample size; n = small lot sample size.

Cold-Dip Plastic Coating Simplifies Corrosion Protection

♦ A SIMPLER METHOD of protecting metal parts from corrosion in storage has resulted from development of cold-dip plastic coatings. The cold-dip plastics provide a strippable protective coating without the disadvantages usually connected with hot molten plastic. Coatings from 1 to 60 mils may be applied without preheating parts. Coatings up to ¼ in. are possible where parts are preheated.

The hot-dip coatings previously used required special melting kettles. Dipping solutions were maintained at 350° to 500°F depending on coating thickness required. Excessive overheating frequently caused deterioration of the cellulose acetate butyrate composition used. Loss of coating strength and an objectionable odor resulted. To avoid charring and deterioration by prolonged heating, dipping kettles must be emptied once a week and thoroughly cleaned. Also, the high heats used were a safety hazard.

The cold-dip coatings, developed by R. M. Hollingshead Corp., Camden, N. J., are a specially formulated plastisol composition. The plastisol is a fluid dispersion of a vinyl resin in plasticizers to which stabilizers, rust inhibitors, colors and fillers have been added. The plastisol is also used as a vehicle to carry special corrosion inhibitors.

The plastisols are readily converted into tough coatings by heating them to about 300°F. Infra red lamp or other heating methods may be used. Parts to be dipped should be thoroughly cleaned to avoid contamination. The plastisols do not deteriorate and dipping tanks do not have to be emptied and cleaned.

Almost any item which can be mounted or immersed can be dip coated. The amount of deposit is controlled by the rate of withdrawal and by the temperature of the object being coated. Flow properties of the plastisols are largely determined by the amount and type of plasticizer present in the composition. A specific plastisol with a fixed viscosity will deposit a definite coating thickness onto a surface. The coating thickness can be varied by slowing down the withdrawal rate or using multiple dips.

BRAZED, WELDED TUBING
Coated For Corrosion Protection

By Herbert Chase
Consultant
Forest Hills, N. Y.

Brazed and welded ferrous tubing, fortified with copper, tin or lead coatings for corrosion protection, is rapidly produced on a continuous basis at Rochester Products Div. of General Motors Corp., Rochester, N. Y. Starting as ribbons of steel, tubing is formed, brazed or welded, bath dipped or electric plated, tested and coiled or cut to length.

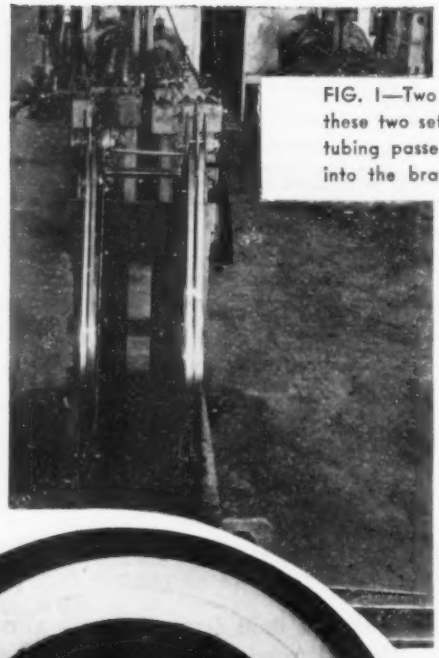


FIG. 1—Two scarfed edge ribbons are fed into each of these two sets of double-wall tube forming rolls. Formed tubing passes through rolls and rotary swaging machine into the brazing furnaces, background.

◆ HIGH SPEED, LOW-COST METHODS of producing small diameter brazed or welded coated steel tubing have helped meet expanding demands for this product. Several unusual production techniques have been developed by Rochester Products, Div., General Motors Corp., Rochester, N. Y., to supply aviation, automotive, appliance and machinery builders with tubing ranging from ⅛ to 1 in. in diam.

Typical uses include hydraulic, fuel and oil lines. Use of copper and other nonferrous tubing has, in many cases, been superseded by the ferrous type because it does a better job at lower cost.

Rochester Products pioneered in the manufacture of a double-wall brazed tubing made from two ribbons of steel. Ribbons are scarfed by rolling along both edges to taper the section

FIG. 2—Section of the brazed ¼-in. double-wall tubing produced from a pair of scarfed edge ribbons of steel. Tapered overlaps are brought to knife edges by swaging the tubing after it has been roll formed. x20

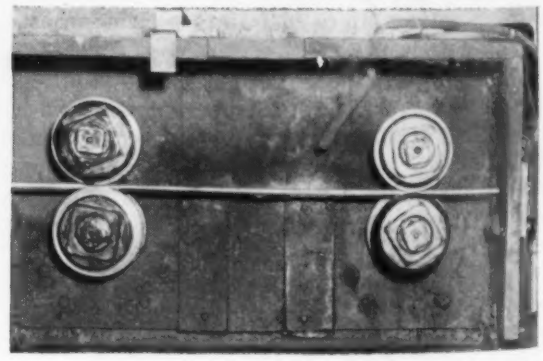


FIG. 3—Small furnace, shows copper alloy rolls that feed alternating current through the welded tubing. Current heats and anneals the tubing, in a slightly reducing atmosphere, as rapidly as it comes from the mill.

adjacent to these edges. This helps make edges conform to a true circular section, both inside and outside, when the tubing is formed.

Forming is done in a combined rolling and swaging setup, Fig. 1. Ribbon steel is fed from two coils through a device that scarfs both edges, then through a set of rolls simultaneously and in such a way that joints will come about 180° apart. This makes the wall of substantially double metal thickness throughout. At joints there are actually three thicknesses of metal, two of them tapered so there is no considerable increase in total joint thickness.

Rolling and swaging continuous

Knife edges shown at the overlap in Fig. 2 are produced by rotary swaging dies through which the tube passes immediately after being formed. Swaging is done over a mandrel that extends through the rolls and into the swaging die and insures correct internal diameter. Besides bringing the outer lips to knife-edge form, the swaging forces the inner lips into the adjacent wall and keeps the hole cylindrical.

Both rolling and swaging are continuous. The formed tube passes from the swaging machines and then into the brazing furnaces. Brazing is continuous and radiant heat in three zones is supplied by electric resistance elements in which the current is precisely controlled. In the brazing zone, the tube passes through a bath of molten copper maintained at constant level by feeding in copper wire of ⅛-in. diam. The rate of feed is sufficient to make up for consumption of copper. Enough heat is supplied to convert the copper wire into molten copper.

Joints brazed for strength

Before leaving the furnace, the tube is cooled to about room temperature. Brazing provides joints of high strength. Tube strength approximates that of seamless steel tubing of the same size and total wall thickness. The copper coating aids corrosion resistance.

Tubing made in this manner requires more operations and material compared with single-wall resistance welded tubing. The latter, made from a single strip, requires no scarfing and is produced at a faster rate. This gives single-wall tubing a price advantage where internal flash is not detrimental.

In double wall tubing, 3/16 in. is the smallest diameter made directly on the rolls and 0.020 in. is the minimum wall thickness produced. Welded tubing is produced in diameters from 3/16 to 1 in. and wall thicknesses from 0.020 to 0.080 in. Some tubing is drawn in a secondary operation when sizes below 3/16 in. are ordered.

Welded tubing is produced on a continuous basis. Operations include forming, trimming flash, sizing, resistance annealing, coating, when specified, and coiling.

Wide stock is slit to ribbon width and delivered by conveyers in coils to the tube mills. These machines formweld, remove external flash and reduce the tube to final size. Tubing is then run into continuous annealing furnaces, which are heated by electrical resistance while the tube moves at the same rate at which it leaves the sizing rolls.

To apply current for annealing, tubing passes through pairs of copper alloy rolls so arranged that alternating current from a transformer is passed into and through the tube as it feeds from one set of rolls to the next. The relatively short, and compact furnace used has a reducing atmosphere to give a bright anneal. From the furnace the tube passes through a cooling chamber and, unless a nonferrous coating is specified, is then coiled. Coils are transferred to a conveyer and carried to a test bench. Here they are tested at pressures up to 5000 psi for 3/16-in. size and at lower pressures for larger sizes. Defective tubing is cut out and scrapped.

Annealed, coated in furnace

Copper, tin or lead coating, where specified, are applied by passing the tube through baths of the molten metal generally after the tube issues from the annealing furnace. When a Fuse Kote of copper is specified, both annealing and coating are done in the furnace, Fig. 3. Application of this coat makes it necessary to raise the tubing above annealing temperature. Voltage is adjusted to provide sufficient heating and to yield a temperature of 2000°F just before the tube passes through the second set of contacts.

A fine copper powder mixed with paraffin oil is used. This mixture is pumped via tube from an agitated tank and fed onto the tubing just after it passes through the first set of rolls. Excess mixture falls into a trough and returns to the tank. As the oil is vaporized, the powdered copper remains on the surface of the tube, melts and forms a fused coat before the tube enters the second set of contacts.

In some cases, an electrolytic coating of copper is applied. Usual thickness of electrolytic coating is 0.0004 in. A method has been developed to apply the coating at a rate of 40 fpm for large sizes and at double that speed for small sizes.

Tubing is fed from a coil through a pickling and then through the plating solution. During plating, current to 4000 amp is applied. Plating baths including rinses, are in tanks set end to end. The tubing passes through them in series, generally being carried through a ceramic bushing at each end of each tank. Bushings are below the level of the liquid in the tank and some leakage occurs. Pumps are used to return the leakage and to maintain a level well above the tube.

THE AUTHOR—Mr. Chase, engineer, former trade magazine editor, and author of engineering texts, has been closely associated with industrial developments since 1910.

For better finishing—

Modern Plating Equipment Is Designed For Any Shop

Filters, Pumps, Heaters, Temperature Controls, Agitators, Exhaust Systems, and Racks and Tapes

Second of a series

By John E. Hyler
John E. Hyler & Associates
Peoria, Ill.

The quality of electroplated deposits depends largely on proper care and use of the electrolyte. Solutions must be kept clean by filters, filter bags, diaphragms, demineralizers and other devices if smooth deposits are to be expected. Pumps, agitators, heaters and temperature controls are further aids in promoting the quality and uniformity of deposits.

◆ QUALITY of electroplated deposits depends largely upon the cleanliness of the electrolyte. Dust, dirt, sludge, precipitates and other solid particles must be removed from the electrolyte if smooth, uniform coatings are to be obtained. This may be done either by periodic or continuous filtration. The solutions used affect the rate and method of filtration.

Filters are made of various metals to withstand the corrosive actions of the different electrolytes. Selection of the proper type of filter for a specific solution should be made according to the recommendation of those who make solutions. Generally, a pressure-type filter is used in conjunction with a centrifugal pump which withdraws solution from one point of the tank and discharges it at another.

Continuous filtration has advantages other than that of removing fine particles from the bath. Stratification of the bath is prevented by the continual movement engendered in the solution. Additions of acid, peroxide or other agents to the electrolyte are mixed more rapidly resulting in a bath of more uniform composition. Many filtering units are operated in conjunction with a tank heating system.

It is usually desirable to provide a filtration pump with two tank outlets, one near the bottom to withdraw settled particles and the other at solution level to skim off the surface. Location of the inlet point for the freshly filtered electrolyte also benefits the solution. It is usually discharged into the tank where the work enters. This point is usually on the tank side diagonally opposite the outlet.

One effective type of filter is equipped with banks of vertical leaves and an outlet manifold near the top of the filter tank. With the outlet manifold in this position, a uniform pre-coat is deposited on the leaves because filtration begins simultaneously through all active filtration areas. The leaves of channel construction provide ample space for free flow of filtrate to the manifold.

Generous cake space is also present to permit carbon treatment of the solution. A large sludge chamber provides for less frequent cleaning and consequently less down time. These filters have an air manifold incorporated below the filter leaves to permit quicker cleaning with compressed air and water. Air agitation of the wash water quickly dislodges the filter cake and leaves the filter ready for a new filtering cycle. Cleaning is accomplished without removing the tank cover or dismantling the filter.

The best arrangement consists of a filter for each tank but many portable filters are made

which can be moved easily from tank to tank. Filters of this kind can be cleaned by simply pumping a clean solution through them, followed by clean water. The same filters can be used to increase the life of electrocleaners and cyanide dips, or to filter water in making new solutions.

Many electroplating difficulties caused by impurities in the plant water supply can be remedied by using a suitable filter. All dirt, slime, rust and collodial vegetable matter usually present in all water, is removed. Some of these filters use special filter disks composed of dozens of layers of fibers. The fibers on the top or rough sides of these disks are long and loosely matted. Each succeeding layer contains shorter and more closely packed fibers.

With this type of filter, the loose top layers catch the coarser particles and succeeding layers stop finer particles as they penetrate through the disk. After the entire solution has been filtered, it is completely free of all foreign particles and cloudiness. Disks are available in various grades and degrees of porosity to cover a wide range of flow rates and clarity characteristics.

On very large tanks, two filters of this type can be mounted on a single stand or a number of filters can be connected in parallel to provide necessary capacity. A number of filters may be spaced a sufficient distance apart on long tanks for more complete filtration of the solution. The advantages in using several small filters instead of one large one are that maintenance problems are simpler and a specific filter may be cleaned or repaired while the others are running.

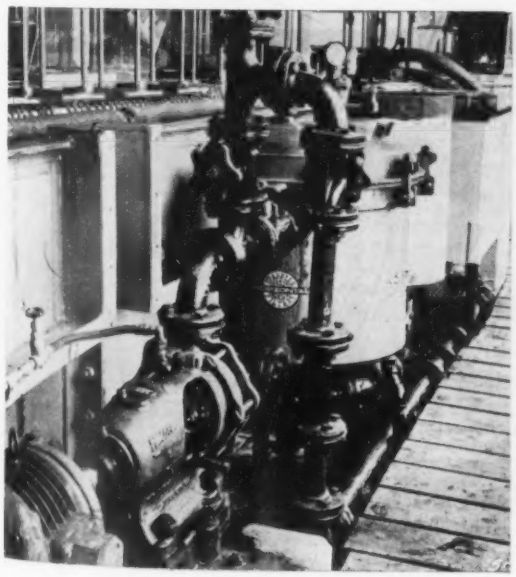
Even where continuous filtration is practiced, it is often desirable to pump the entire bath into a storage tank periodically to allow thorough cleaning of the tank. A predetermined amount of filter aid is sometimes mixed with the solution after which the electrolyte is filtered back into the plating tank. While the electrolyte is in the storage tank, adjustments can be made in electrolyte concentration and pH before the solution is returned to the plating tank.

Organic materials will cling to activated carbon. For this reason, activated carbon is often used to pre-coat a filter before passing plating solution through it. It will continue to pick up organic matter to its adsorptive capacity after which the filter must be changed and again precoated.

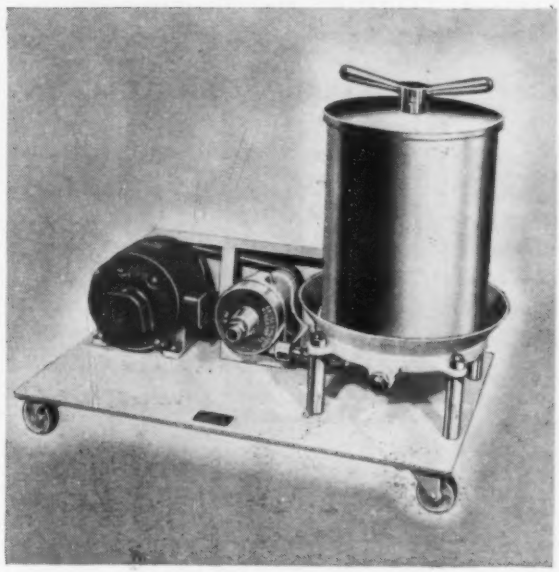
Filter bags made from a bleached and sanforized muslin are another aid to clean solutions. These bags have a ply of high, wet-strength filter paper inserted between two layers of muslin. They are suitable for non-agitated cold and warm nickel solutions where good filtration is desired. Solution from the anode compartment must pass through the filter paper before diffusing in the main body of the electrolyte. Such bags are particularly desirable where other adequate filtration is not possible. They are not intended to compensate fully for deficiencies in filtration nor are they recommended for vigorously agitated solutions.

Use of diaphragms in plating tanks is another development closely related to filtering. The system interposes fabric diaphragms or partitions between the anodes and the work being plated. This prevents particles formed at the anode from settling on the work. This method of filtration provides better plating quality especially in cyanide copper baths.

Demineralizers are now used extensively to



HORIZONTAL PLATES in this filter enable the solution to flow with gravity. Filter cake is held stable.



PORTABLE FILTERS of the cylinder disk type accommodate 4 to 30 asbestos filter disks.

Corrosive solutions, abrasive particles make pump selection difficult . . .

remove impurities from the plant water supply. They definitely aid in providing stability and uniformity to the electroplated product. Some large units handle as much as 1000 gal per hr of water. Small units have a capacity of 100 gal per hr.

Pumps and Heaters

Selection of a pump for a filter unit requires careful consideration because plating solutions contain not only corrosive ingredients, but highly abrasive particles. Pumps must run without lubrication to avoid contaminating the solution.

One highly efficient pump specifically designed for plating solutions uses a special vitrified revolving seal running against a stationary hard carbon block. Rubbing surfaces are ground, lapped and highly polished to assure a leakproof fit between them. The surfaces must be kept wet to prevent heating, therefore, filtered liquid is fed back from the outlet side of the filter to the sealing surfaces under light pressure. This supplies a clean lubricant that practically eliminates wear.

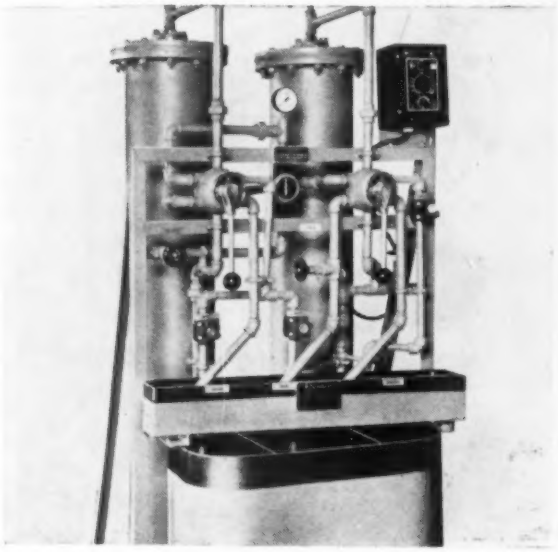
The same filtered liquid follows the pump shaft back to the pump chamber and forms a clean liquid bearing the full length of the impeller shaft inside the pump. This feature eliminates all wear from the pump shaft regardless of abrasive particles in the solution. Where solutions are almost neutral, steel pumps may be used. For strong acid solutions, a pump made of Duriron, stainless steel or other corrosion-resistant material should be used.

Many solutions used for electroplating are heated by gas, oil, electricity or steam coils. Steam coils used within a tank provide a specific heating area calculated from the diameter and length of pipe used. Pressure of the steam is another factor. The amount of heat introduced into a tank may be controlled by proper correlation of these factors.

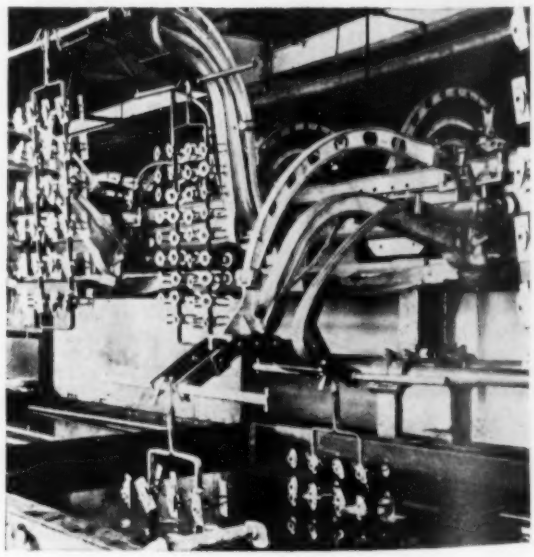
Coils are sometimes used on all four sides of the tank. In other cases, coils may be located on one side only for more efficient movement of the electrolyte. The solution takes an upward course at the coil location and induces a flow toward the coil along the bottom of the tank and an outward flow across the top of the tank from the coil. A downward current is induced on the opposite side of the tank. Coils should never be placed between the anode and cathode. Joints in steam coils should be made of insulating material to prevent leakage of current through the steam lines.

Gas burners for heating solutions are usually located underneath the tank although some special gas burners fire tubes built into the tank. This latter type of heating is necessary where heat cannot be applied directly to tanks lined with certain materials.

Heating of a solution outside the plating tank is frequently accomplished by heat exchangers. The electrolyte is pumped from the plating tank



TWO-BED DEMINERALIZER can treat up to 1000 gal per hr of water. It rids plant water supply of impurities.



MECHANICAL AGITATION is obtained from the double-row agitating arms in transfer and down positions.

through the heat exchanger and back into the tank. Although an additional pump and piping are required, the need for heating units inside the tank is eliminated. Some heat exchangers are operated by steam and arranged so that water may be run through the exchanger when desired for cooling a solution. Because the heat exchanger is outside the tank, maintenance is greatly simplified.

It is not possible to heat a nickel plating solution by external means. A Karbate coil is often used inside the plating tank between the anodes and the tank sides. External heat exchangers are also made of Karbate, Pyrex glass or high-silicon corrosion-resistant iron, such as Worthite, Duriron or Durichlor.

Another method of heating plating solutions is by means of steam jets. Steam is admitted to the bath through open ends of immersed steam lines. This method of heating is advantageous because it provides an unobstructed tank interior. However, such a tank is quite expensive and heat losses by radiation are considerable unless the outside of the jacket is carefully insulated.

A recently developed device for heating is the Platecoil. It consists of embossed metal plates permanently welded which provide rapid, uniform heat. The plates provide high heating capacity for their area and require little space. They are easily cleaned, require no dumping of solution and no down-time for repairs. Installation is quite simple and initial cost low. Such units can be used either for heating or cooling in plating, degreasing, pickling or anodizing operations.

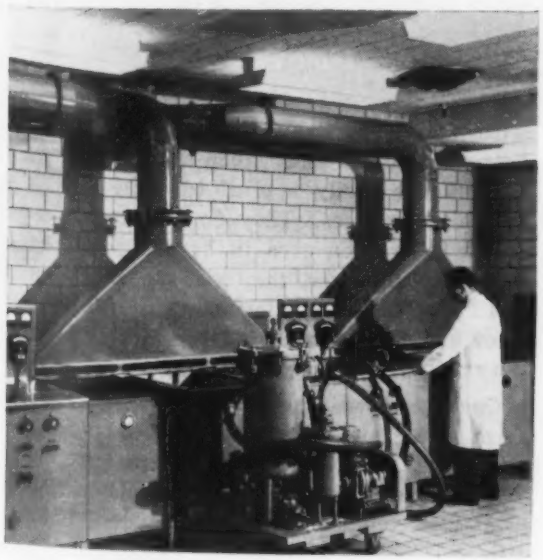
Electric immersion heaters are often favored because they are clean, efficient and require little space. The encasing materials must resist the corrosive action of the electrolyte and are therefore made of materials such as impervious graphite and vitreous silica. These materials are unaffected by muriatic, nitric, sulphuric, hydrobromic, chromic, acetic or lactic acids, or bromine or chlorine mixtures, regardless of concentation or temperature. They are also immune to extreme electrical and thermal conditions.

Precision engineered controls for regulating solution temperatures are of great value. Some leading manufacturers of recording and controlling instruments have developed temperature control systems particularly suited for electroplating. One such system accurately controls both heating and cooling of a plating bath. Control is accomplished by a single instrument which may record or simply indicate the temperature.

A controller of this type operates two staggered diaphragm valves. One of these for controlling steam is reverse acting, using air pressure to open. The other valve for cooling water acts directly, using air pressure to close. An air failure will cause the steam valve to close and the water valve to open thereby preventing damage from overheating the equipment or bath.

When the temperature is below an established point, the controller shuts off the cooling water and allows steam to enter the tank coils. Conversely, when temperature rises above the set point, the steam valve closes and the water valve opens. With the bath temperature at a preset point, the controller throttles one valve to a partially opened position allowing limited flow of either steam or water through the coils.

Some controls are of the electrically-operated type. Solenoid valves maintain any desired plating temperature. Controls of this type are available for alternate heating and cooling such as may be used in chrome plating.



MODERN SETUP in which temperature of solution is held at constant level by electric controls.

Agitators

Agitation of the plating solution is another aid in acquiring uniform deposits. Compressed air is frequently used for this purpose. Some air compressors such as reciprocating type are fitted with carbon piston rings and deliver oil-free air. If there is any question of oil reaching the plating solution, the air should be passed through suitable cleaners or traps.

Compressed air for agitating solutions is flexible in its application. Air may be released into any part of the tank and the degree of agitation can be accurately controlled. One disadvantage in its use is the introduction of oxygen into plating solutions which adversely affect certain solutions and certain types of plating.

Mechanical agitation introduces no oxygen to

Hydrogen bubbles which pit the work are reduced . . . More uniform deposits are obtained . . .

the solution. Many automatic setups incorporate facilities for moving the cathodes through the solution. The anodes are moved in some cases. Mechanical stirring devices are used to a limited extent. Where the electrolyte is continually pumped to and from the plating tank for filtering or heating, a certain amount of agitation automatically results.

Some cathode rod agitators have an actuating mechanism consisting of a motor, speed reducer and a rocking device. An agitator of this type provides 16½ strokes per min or a total movement of about 100 to 200 in. per min. Hydrogen bubbles which pit the work are greatly reduced. More uniform deposits are also obtained on recessed work. Severe agitation reduces throwing power.

Exhaust facilities important

One special type of agitator incorporates one or more distributor heads which assure a controlled-direction flow of solution at the cathode area. The heads also provide a flow of new solution adjacent to the work while constantly moving spent solution to the anode area for replenishment. These agitators are made of stainless steel, carbon steel, hard rubber or plastic depending on the plating solution.

In one case where these agitators are used for lead plating bearings, the bearings are assembled in stacks and positioned on the distributor heads. Fresh solution flows through the stacks of bearings and over their inner surfaces at rates up to 40 gpm. Smooth, heavy lead coatings with maximum brightness are deposited at extremely high current densities.

Adequate exhaust facilities are important in the modern plating shop. This is of particular significance where high-temperature plating baths are used. Many states have enacted legislation with preference to fume disposal. Exhaust systems may be designed to carry fumes either upward or downward depending largely on the plating layout and the solutions used.

Where handling equipment such as monorails, chain conveyers, hoists and cranes are overhead, it is usually best to remove fumes in a downward direction. The weight of the fumes will also determine the direction of removal. Vapors considerably heavier than air can be removed more readily by the downdraft method.

It is best to plan the exhaust facilities before tanks are installed otherwise installation of an exhaust system may result in difficult problems. Some manufacturers of standard plating tanks provide exhausting jackets or hoods as an integral part of cleaning and pickling tanks. However, proper installation of exhaust systems should be left entirely to specialists in this line.

In chromium plating tanks, hydrogen is given off by the cathode and oxygen by the anode. Bubbles of these gases burst at the surface of the solution diffusing spray particles of chromic acid into the atmosphere. Horizontal fume removal is often used by placing collecting ducts along the tank edges on two sides and one end. Different volumes of air should be exhausted where different sizes of tanks are involved.

Spray floats help retain heat

Another method of preventing diffusion of spray particles of chromic acid into the air is by the use of spray floats in the plating tanks. These are pillow-shaped polystyrene tubes having a 2¾-in. length and a ⅜-in. diam. A 1-in. blanket of these floats over the surface reduces escaping spray to a minimum.

Spray floats also help retain heat inside the tank and conserve the supply of chromic acid. They are extremely helpful in protecting operators from skin and nasal irritations. Only about 1½ lb of floats is required per sq ft of solution surface area. These floats are practically indestructible and can be used indefinitely. They do not adhere to or interfere with insertion or removal of work.

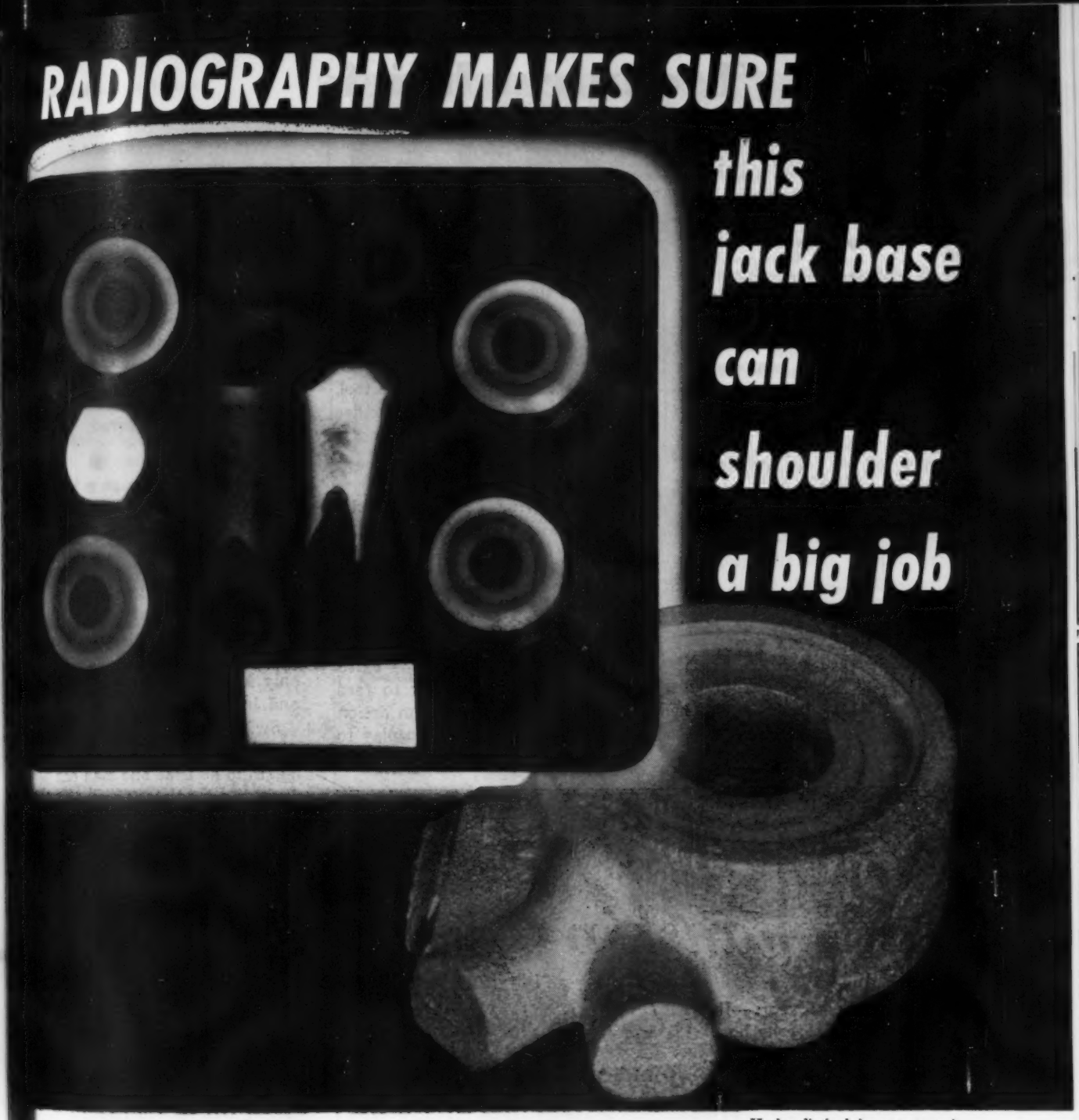
Racks

Properly designed and insulated plating racks are highly important. Theoretically, it is best to insulate a rack completely except for the contact points. Different insulating materials can be used. Rubber coatings are suitable in many plating solutions but are readily attacked in other solutions. In some instances, the rubber deteriorates quickly while in other cases it contaminates the bath.

Tapes having a strong plastic backing will withstand acids, alkalies, water, salt water, alcohols or hydro-carbons. Such tapes stretch readily and are easily applied to oddly shaped or irregular surfaces. They do not crack, become brittle or weaken even in hard chrome plating solutions. However, they will not resist potash and trichlorethylene cleaners or degreasers. They are particularly good for making immediate repairs on broken insulation.

One synthetic thermoplastic resin in tape form possesses high resistance to abrasion and wear and has excellent dielectric properties. When properly applied, it is non-blistering even at extreme temperatures or in high current densities. It resists all cleaning, pickling and plating solutions commonly used in electroplating operations and will not contaminate any solution.

RADIOGRAPHY MAKES SURE this jack base can shoulder a big job



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DRILL FIXTURE:

Unusual fixture saves time and avoids large outlay

An ingenious fixture harnessed to standard machine tools has saved the Ryan Aeronautical Co. thousands of manhours in machining complex jet engine components. The work involves precision boring, turning, facing and undercutting of flanges in the aft frame to tolerances of 0.005 in. and finishes of 63 rms.

Savings — Without this fixture, a boring mill or specially-designed machine to do the job would cost about $40,000. The fixture used costs $13,000 and a radial-arm drill, to which it attaches, costs about $9000. Nearly 90 pct saving in machining time is possible using the fixture.

Two Units—A boring head and holding fixture are needed. The vertical boring head spindle is actually a shaft within a shaft attached directly to the radial-arm drill by a shear pin.

At the other end, is a circular cutting head with four sets of dual carbide-tipped tools, each pair including a rough and finish-cut tool. The heavy cast iron holding fixture holds the aft frame securely. It rotates to permit indexing of the unit.

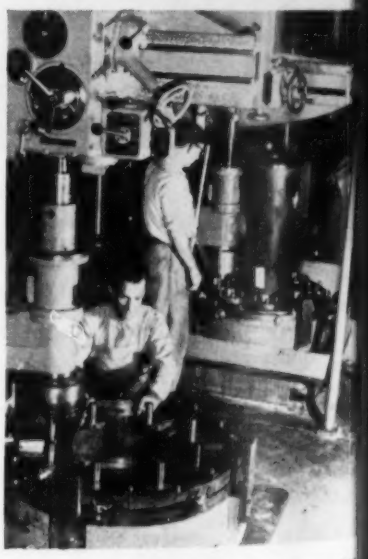
As the boring head spindle descends, the first pair of cutters bore the inside diameter of the flange. The second cutters turn the outside diameter. Outer shaft descent is stopped by a pilot. The inner shaft continues to descend and actuates bell cranks which move the third set of cutters horizontally to face the top of the flange. Cam action brings the last cutters into play to undercut the flange on a bevel.

Timing — Operations follow in rapid sequence and exact timing is necessary. A special system of timing pins are grooved into the shafts to coordinate motion of the part. Because the cycle of operation is automatic, the operator need only load and unload the machine and index the frame.

Swinging cranes, with air-operated hoists, are located at each machine so that one man can perform the loading. The radial drill arm and boring head are easily swung to one side to allow room to load the holding fixture. Water soluble oil is pumped to the cutting head, from a collecting reservoir, to remove heat generated by friction.

IF YOU WANT MORE DATA

You may secure additional information on any item briefed in this section by using the reply card on page 81. Just indicate the subject heading and the page on which it appears. Be sure to note exactly the information wanted.



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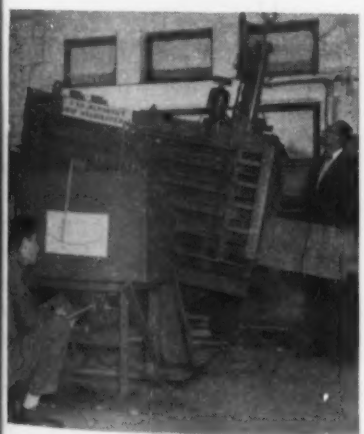
ASTE MEETING:

Increased productivity, cost reduction to be stressed.

Increased productivity and cost reduction, two vital factors in the economic success of America's industrial production program for many years to come, will be emphasized in the technical sessions at the 21st Annual Meeting of the 23,000-member American Society of Tool Engineers to be held in Detroit at the Hotel Statler Mar. 17 to 20, 1953.

The 21-paper technical program, one of the most comprehensive in the Society's history, covers many new fields in which tool engineers are now actively engaged.

Production—Papers cover processes, stressing highly productive types such as contour forming, spinning, drawing and high-speed boring. Other papers deal with product design, metallurgy, automatic materials handling equipment, "pushbutton plants" and expense controls.



HURRICANE TOSSING of a navy destroyer can be duplicated in this laboratory apparatus at Stanford University's Mechanical Engineering Laboratory. By turning a switch, researchers activate a built-in automatic stabilizer which eliminates rolling in seconds. Water tanks on each side of "U.S.S. Minorsky" are connected across bottom by a large pipe. Automatically controlled pumps rush water through pipe into tank on rising side to keep ship on even keel. Using this laboratory "destroyer," Stanford University technicians are able to accurately predict in the laboratory how a ship will act at sea.

Turn Page

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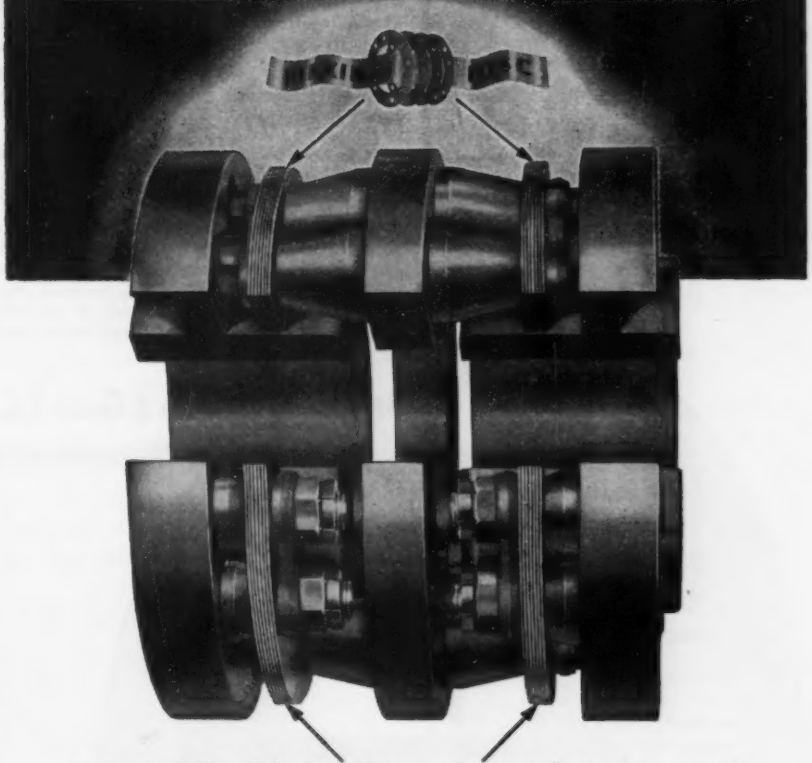

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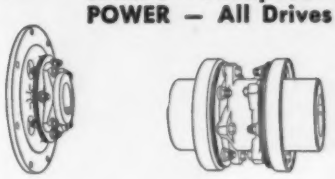

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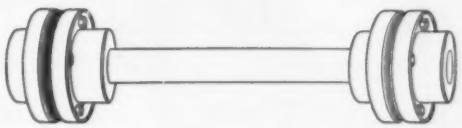

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WARREN, PENNSYLVANIA, U.S.A.

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WHEN the functional efficiency of your product is largely dependent upon the effectiveness of its integral power transmission system, the quality of the gears you need to transmit power is the major consideration.

Through its entire 35 years of operation, Perkins has specialized in the production of gears to customers' specifications—any size, any quantity, metallic or non-metallic. Consequently, among consumers of custom-made gears, PRECISION & PERKINS are accepted as synonyms. For trouble-free power transmission, specify Perkins custom-made gears. Have us quote on your requirements!

NOTE 1: A new product is the **Perkins Precision Spring Coiler.** This coiler (patent applied for) turns out precision springs – any type, shape, size, from wire sizes .005 to .125.

2: Another new product – the **Perkins "Bendi-15"** – a patented metal forming machine bends and shapes sheets, rods; strips tubing into innumerable complex as well as simple forms that would be difficult or impossible to make by other means. Eliminates need for expensive tools or specialized skills. Ht. 47", net wt. 200 lbs. Write today for descriptive catalogs, prices etc.

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West Springfield, Massachusetts

This is an aircraft engine gear custom-made by PERKINS.

PERKINS ALSO MAKES:
Helical Gears
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Sprockets
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Worm Gears
Spiral Gears
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Ground Thread Worms

RADAR:

Breaks in electric power lines located rapidly with radar.

Successful use of radar for almost instantly locating distant breaks in high voltage electric power transmission lines has been reported by Pacific Gas & Electric Co.

Coupled with radio dispatching of trouble-shooting crews to the scene of a break, this new industrial application of electronics marks an important advance in the maintenance of uninterrupted power supply. Time required for repairs often can be greatly reduced.

Under Test—The equipment has been under test on the company's system for several months and winter storms now have provided the actual operating experience.

During a recent heavy snowstorm the repair of a break that occurred on a snow-laden 60,000-v power line from Shasta County to Eureka was materially speeded. Operators were able within minutes to pinpoint the trouble 75 miles away, the company said.

Old Style—Crews in the field have had to check damage lines by repeated switching, checking the line a few miles at a time until the break was found. The radar set sends high frequency impulses along the wire to the point of the break. Part of the pulse energy bounces back to the sending set. The distance of the break from the transmitting point then is read directly from a dial calibrated in miles.

Instruments—Maximum effective instrument range is 200 miles. They are so sensitive, engineers say, that presence of a lineman on a steel tower, washing insulators with a stream of water, could be detected by an operator in a substation miles away.

PG&E now has 58 central radio stations which maintain communication with 717 radio-equipped service cars and trucks, including 18 Sno-cats.

Are Some Steel Users Overplaying Procurement?

Market seems stronger than ever . . . But some signs of strength may point to uncertain future . . . Aggressive procurement may be followed by wave of inventory correction.

A careful check of the steel market this week shows overwhelming demand, but some of these very signs of strength may point to an uncertain future. Why? Because some consumers, fighting a challenging battle of procurement, may be overplaying their hands.

There is no reason to suspect the market in the near future. Demand is overwhelmingly strong. But the psychology of shortage is a powerful force that could bring on a mild case of boom and bust. The inventory correction of 1950 could be repeated in the second half of 1953, or early in 1954.

Inside Story—An IRON AGE survey of steel inventories in major consuming centers indicates that steel stocks are gaining, but inventories are still badly unbalanced. Juggling of stocks to get badly needed items makes steel supplies seem smaller than they are.

Industrial purchasing agents, spurred by front office races for the consumer market, are extremely aggressive in their procurement. In competitive consumer durable goods industries (such as autos and appliances) every possible pound of steel is being thrown into the race to reach the customer first. This is adding terrific pressure to the market.

Discounting Controls—Some purchasing agents are already discounting the lifting of steel controls. In their aggressive buying, they appear to be paying little heed to (1) Controlled Materials Plan quotas, or (2) Inventory restrictions.

Many PA's are admittedly overordering, apparently on the theory that only part of their order can be filled anyway. In a number of instances shaving of inflated orders may have resulted in delivery of about as much steel as had been hoped for in the beginning.

No Production Lost—THE IRON AGE discovered no important instances of production lost for lack of steel. However, there were many claims that manufacturing schedules would have been set higher if promise of more steel could have been obtained.

Purchasing agents reported inventories ranging all the way from hand-to-mouth to more than 90 days. Inventories averaging 30 to 45 days were reported most often. Heavy industries generally reported biggest inventory, due to longer lead time required.

Unbalance Hurts—In industries where the production drive is the strongest inventories are generally lower. For example, inventories in Detroit are generally smaller; and manufacturers in this area are also exerting strongest demand for steel.

Unbalance is still the keynote of the inventory picture. Many seemingly comfortable inventories are crippled by shortages of one or more items. The search to fill these troublesome holes is relentless, accounting for much additional pressure in the market. It also accounts for an undue number of emergency calls for "department store" delivery from warehouses.

Going Great Guns—Warehouses, though doing an unprecedented amount of business, have been able to gradually increase their stocks. Their inventories have risen from a whobbly 400,000 tons or 36 pct of "normal" last Aug. 1, to an estimated 677,000 tons or 65 pct of normal. Here again unbalance is limiting the effectiveness of overall stocks. Hard-to-get items do not stay on the shelves.

Although no one can discount current demand, some consumers may be clamoring louder than is necessary—with an eye to the lifting of controls. Both consumers and mills are anxious to reestablish market relationships. Experienced purchasing agents realize that their steel receipts will probably again be determined by mill quotas, as they were before CMP. Some may be working on the theory that it is easier to cancel an order than to increase a quota.

Why Be Cautious?—Steel producers are keenly aware of their growing production capacity. They know that current production is slowly raising inventories, as well as supporting higher manufacturing schedules. New capacity yet to come will speed the process of catching up.

When the word gets around that steel orders can be placed with promise of early delivery, they fear many consumers may alter their buying policy. Any weakness in sales of consumer durable goods could bring an inventory correction both sharp and painful. This is the thinking behind some words of caution that have been voiced.

Record Production Holds—Steelmaking operations this week are scheduled at 99.5 pct of rated capacity, unchanged from the previous week. Barring unforeseen trouble, the outlook is that the industry will continue (or even exceed) this record pace in the weeks ahead. As the expansion program enters the home stretch, production efficiency should increase with completion of facilities which will contribute smooth operation.

Oil-display service cabinets get lasting paint adherence

Industry surveys indicate that between 70% and 90% of all automotive lubricating oils are sold in cans... much of it from oil-display service stands fabricated of Republic Electro Paintlok by Modern Metal Products Co., Greensboro, N. C.

● To keep oil-display service cabinets looking trim, bright and attractive on service station islands, this manufacturer has adopted Republic Electro Paintlok for all enameled cabinet surfaces.

Electro Paintlok is the zinc-coated sheet steel that's chemically-treated to *take* paints, lacquers and synthetic enamels *smoothly* . . . and *hold* them all equally well.

Even if the painted surface should be scratched or broken in service, the tight zinc coating prevents the spread of unsightly underfilm corrosion. Result: users of steel products enjoy a painted finish that *lasts.*

Electro Paintlok offers manufacturing economies, too. It comes to you in prime condition for painting, and usually requires only one simple cleaning to remove dirt acquired during storage and fabrication. Degreasing is necessary, however, when drawing compound is used, or when grease is present from other sources.

For all its full product-improving story, write for colorful free booklet 525. Address:

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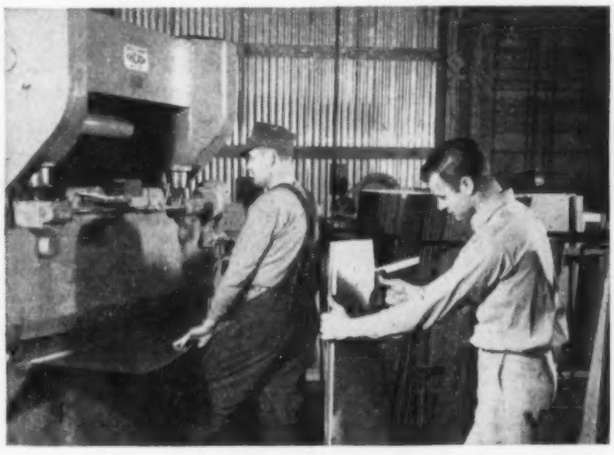
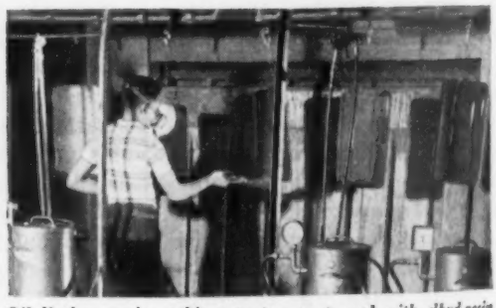


Republic Electro Paintlok offers a tight zinc coating that will not crack, peel or flake during normal fabrication.



Oil-display service cabinet parts are sprayed with alkyd-resin enamel primer heated to 150°F.

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Other Republic Products include Carbon, Alloy and Stainless Steels—Sheets, Strip, Plates, Bars, Pipe, Tubing, Bolts and Nuts, Wire

Market Briefs and Bulletins

Inventories Unbalanced—Tubular heat exchanger manufacturers report inventories are slightly lower than last fall. Main problem is trying to locate heavy steel plate. Spot shortages have unbalanced some manufacturers' inventories and they are relying on warehouses to fill the gaps. Order backlogs range from 4 to 9 months. As a result, the industry's advisory committee is reserving decision on whether to recommend open-ending or junking CMP controls.

Kaiser Price Hike—Office of Price Stabilization last week granted Kaiser Steel Corp. a ceiling price increase of $1 to $4 per ton on the base price of plates, structural shapes and strip. Kaiser is also allowed to decrease its discount on tubular products 1.5 points. Effect of these increases is to raise Kaiser delivered prices to competitive levels. Because of the company's shorter freight haul, the recent uniform percentage freight rate increase made Kaiser's delivered prices lower than those quoted by other mills.

No Coke Change—Despite OPS permission to raise ceiling prices of beehive coke, prevailing market price remains unchanged, and the industry reports the market is sluggish. As long as this condition continues, the price in Pittsburgh will remain at $14.50 to $15 per net ton for oven coke and $17.50 to $18.00 for foundry.

New Aluminum Mill—Harvey Machine Co., Torrance, Calif., will soon begin construction of an aluminum rolling mill on the West Coast. Capacity of the new facilities is expected to be about 30,000 tons per year. It will cost $20 million to get the mill into production.

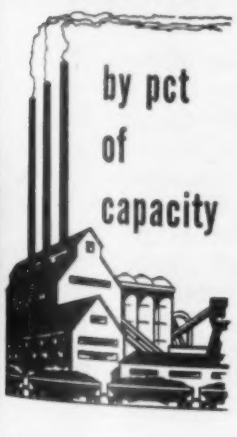
Tool for Consumers—Spokesmen for National Tool & Die Manufacturers Assn. believe the next 12 months will be the heaviest tooling period since the war. At present more than 50 pct of new tooling orders are being placed by the military, but there is a marked trend toward consumer product changeover, particularly in household appliances and electronic products.

Heavy Press Program—Aluminum Co. of America engineers believe it may be 10 years before the Air Force heavy press program is operating at full capacity. Reason is that military planes designed for fabrication on the new presses will probably not reach the production stage until then. In the meantime, the presses will be used to forge and extrude sections of planes now being made in other ways.

Atomic Weapons—Atomic Energy Commission will start construction early this spring of a $29-million plant in Fulton County, Ill., for processing and assembling explosive cores of atomic weapons. Radioactive material will not be manufactured at the new plant. Completion of the project, called the Spoon River Plant, is scheduled for mid-1954. AEC has not as yet selected a contractor to operate the plant.

Price Listing—Inadvertently, one column of the Comparison of Prices section in the Jan. 1 issue of THE IRON AGE, p. 504, was listed under a Jan. 1, 1953 heading. This column, giving comparative prices for finished steel, pig iron, scrap, coke and nonferrous metals should have been headed Jan. 1, 1952.

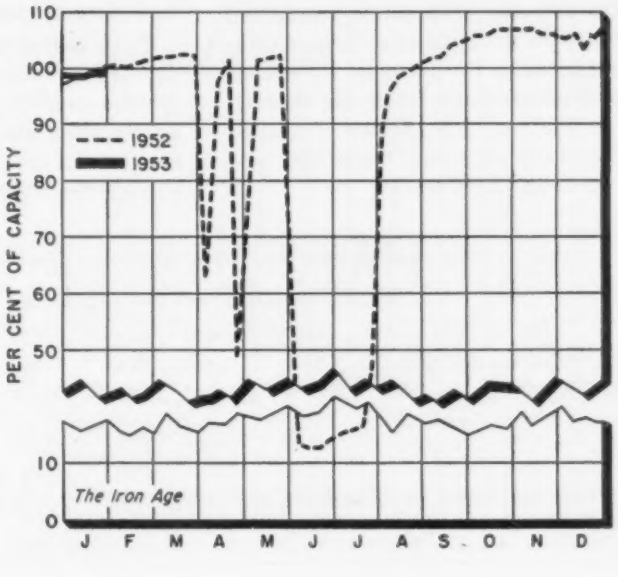
STEEL OPERATIONS



District Operating Rates

District	Week of Jan. 25	Week of Jan. 18
Pittsburgh	105.0	105.0
Chicago	102.5	102.5*
Valley	101.0	101.0*
Philadelphia	96.0	96.0
West	103.0	106.0
Buffalo	94.0	94.0*
Cleveland	96.0	93.5*
Detroit	106.0	106.0
Wheeling	102.0	102.0*
Birmingham (South)	96.0	96.0
South Ohio River	93.0	93.0*
St. Louis	101.0	100.0
East	103.5	101.5*
Aggregate	99.5	99.5

Beginning Jan. 1, 1953, operations are based on annual capacity of 117,522,470 net tons.
* Revised



Fourth Aluminum Round Coming Up?

Sam Anderson thinks another round is likely . . . Price hike, other factors make the financial outlook brighter . . . Contract revisions drastically modified—*By R. L. Hatschek.*

Is a fourth round of expansion coming up for the aluminum industry? Assistant Secretary of Commerce Sam Anderson thinks it likely. Of course, the industry is due for definite growth in the years to come, but the "rounds" are relatively quick-goal expansions requested by the government.

Attainment of present targets will put the nation's aluminum reduction capacity at about 1.7 million tons annually—with six primary producers in the business.

Attractive — A number of factors have combined to slow down the expansion despite general governmental approval. The big three have been held back somewhat by Washington's trust busters. But the outlook is shifting. The recent report of the Joint Committee on Defense Production brought up the point that "competition" was being given precedence over production in Washington thinking on the aluminum industry.

Accelerated amortization benefits are expected to be continued for such projects and, unless Congress acts to prevent it, excess profits taxes are due to die shortly. Legislation for better business credit is expected from the new forces in the Capitol.

Price Up—Last week Office of Price Stabilization, under orders from the defense mobilizers, permitted a ½¢ increase in the price of primary pig and ingot aluminum. A 4 pct hike was also granted for mill products. This comes on top of last summer's hikes of 1¢ and 6 pct.

Adding these up paints a rosier picture for aluminum producers and possible further expansion. The financial aspects did combine to eliminate several potential new primary producers which the government was trying to entice into the field.

Bargaining — The ceiling hikes were the result of negotiations between Office of Defense Mobilization and the big three. ODM's first bid, which offered the same price boosts for several modifications in the government procurement contracts, was flatly turned down as inadequate by the producers. The acceptable terms, under which producers took the price increases, were so modified that they seemed only face savers.

They boil down to three points: (1) The government agreed to firm up the contracts for metal from newly built plants to 5 years, and the producers agreed to (2) not invoke the right to terminate contracts because of poor profit margins for 6 months and (3) let the government buy the plants after 90 days idleness.

New Outfit—A brand new firm is being formed to build and operate a pilot plant for production of aluminum-silicon metal clay. Company is named National Metallurgical Corp. and is owned on a 50-50 basis by Apex Smelting Co. and American Smelting & Refining Co.

Initial operation of the plant, located at Springfield, Ore., is scheduled for sometime before June 1 of this year.

Quota Cutting—The powers in Washington have set a first quarter export quota of 35,000 net tons for copper refined from foreign ores and concentrates. This represents 10,000 tons less than the authorization for fourth quarter of last year. Generally, no exports will be authorized for refined copper shapes produced from domestic ores except in special cases.

Ingot Shipments—Shipments of brass and bronze ingots totaled 22,983 tons in December, according to the Defense Council of the Ingot Brass and Bronze Industry. This compared with 23,441 tons for the previous month and brought the 1952 total to 277,786 tons. Annual total for 1951 was 332,378 tons, 54,642 tons higher. This is a good indicator of the copper and brass scrap shortage.

Lead, Zinc Markets—Pricewise at least, the lead and zinc markets in this country have been quiet during the past week. However, lead is quoted in London at about ½¢ higher than the New York equivalent price. Zinc in London isn't showing any of the strength of lead — traders being described as indifferent. Refined lead production for '52 was 532,778 tons, a big jump from 1951's 486,874 tons.

NONFERROUS METAL PRICES

	Jan. 21	Jan. 22	Jan. 23	Jan. 24	Jan. 26	Jan. 27
Copper, electro, Conn.	24.50	24.50	24.50	24.50	24.50	24.50
Copper, Lake delivered	24.625	24.625	24.625	24.625	24.625	24.625
Tin, Straits, New York	$1.21½	$1.21½	$1.21½	....	$1.21½	$1.21½*
Zinc, East St. Louis	12.50	12.50	12.50	12.50	12.50	12.50
Lead, St. Louis	13.80	13.80	13.80	13.80	13.80	13.80

Note: Quotations are going prices.
*Tentative.

• NON-FERROUS METALS
• ORES AND MINERALS
• METALLIC RESIDUES
• METAL SCRAP
• FERRO ALLOYS

• ZINC

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Market Mood of Scrap Seen Skitterish

Centers see ups and downs in demand and scrap movement . . . Trade takes no encouragement from West Coast . . . Will mills try to lose excess weight? . . . Controls lifting question.

The scrap market was skitterish this week as some areas saw buying spirit relax or firm up a trifle. With reports of pessimism from some districts scrap men could get no encouragement from West Coast developments. There, prices on nearly everything but No. 1 grades bolted downward and scrap was definitely in surplus. This was like the old times for the Coast.

There was talk elsewhere that some time mill consumers would have to cut buying even further to work off more of their stockpile excess. Would this come in the spring when scrap sources were thawing out or would mills feel safe sooner, was one of the questions.

And then there was the possibility of controls being lifted from scrap. No storm of public opinion was seen as being aroused if this was done—for it would be purely an industrial matter.

Pittsburgh — Some sources believe the market will trend toward weakness as spring approaches. No. 2 steel and No. 2 bundles are expected to provide the tip-off. Meanwhile scrap flow in this district is steady with neither consumers nor sellers interested in upsetting the market. Cast continues weak. Demand for turnings was virtually non-existent.

Chicago—Cast grades were continuing to look slightly better last week, with cleaned motor blocks moving into a slightly better demand position. Other grades reported no great change. Locomotive continued in a tough price bracket, with a sale reported at $47.50 on track. Collections were poor at nearly all levels with railroad scrap in somewhat poorer supply, and some seeking for more material from both collectors and industry.

Philadelphia—Pessimism seems to pervade reports of scrap dealers in this district. There is a general tightening of quality requirements and, if anything, a slackening of buying interest. Newest buyer in the area, like almost all other consumers, has a very good stockpile of scrap and is expected to buy smaller tonnages next month. Mill feeling is that winter is practically over and they can live on fat for a while.

New York — The scrap flow is fair and the market is firm. However, the trade has mixed predictions on the future tone of the market. Lifting of price controls and the possibility that mills may be preparing to lose some stockpile weight may make it rough for some lower grades. One consumer in the East has been inspecting more rigidly. A heavy buyer of No. 2, this outfit may be in the market for quality material later. It is reported the mill's orders may slow next month.

Detroit—Fear of a scrap shortage here is diminishing rapidly because of the continued brisk movement of dealer and industrial scrap. Mills are going into February with a vastly improved situation compared with that of a month ago. Electric mills here are in strong condition, a fact that has resulted in a restoration of strict grading. This, in turn, has helped openhearth buyers considerably. This should not be interpreted as a soft market. It is still firm but with blast furnace grades showing a slight weakness.

Buffalo—Lack of buying interest was feature of the scrap market at start of week. Mills appeared to be content to work off large reserve stocks while dealers reported new receipts at yards were light. Some concern was expressed over the prolonged absence of buying in cast as supplies are accumulating in dealers' yards. Cast continues weak at ceiling levels.

Cleveland—Valley mills are gradually working off their inventories. Snow and colder weather haven't affected shipments thus far. One large consumer went into the blast market in a limited way last week. Demand for good grades of scrap continues but most dealers feel they haven't emerged from the inauguration lull. Yard scrap is scarce.

Birmingham—Heavy melting scrap for northern mills again was moving in fair quantities this week, with at least two large mills in the market. Largest southern buyer, however, which returned to the market earlier in the month, now has its stockpile fairly replenished and is limiting shipments. Dealers report more scrap of all kinds is coming into the yards and they are experiencing no difficulty in filling orders.

Cincinnati—Market isn't as strong this week as some dealers expected but steelmaking grades are moving in good volume. Cast market is quiet with very few takers. Borings and turnings are going at ceiling. Some dealers in the area believe eastern buying will postpone any signs of weakness until spring.

St. Louis—Despite the bad weather there has been an improvement in the movement of scrap iron to this district. Steel mills are taking all the melting grades that are being offered. Springboard freight allowance ranges from $2 to $5, according to inventory situation of the mill buying. Movement from railroads is thin. Foundry grades are still dormant and prices are nominal.

Boston—Cast grades are off in the New England market this week. Mixed cupola is quoted at $34 to $35, off $2 to $3 a ton, and it won't move in local areas unless it is of the best quality. Heavy breakable is off $1 and stove plate is down $2. Steelmaking grades are quiet but have shown no signs of slipping below ceiling.

West Coast—(For detailed western scrap picture see West Coast Report, P. 75.) At the 11th hour Friday, one leading steel producer dropped prices on all grades excepting No. 1 heavy melting and all other producers followed. New prices effective Feb. 1 at Los Angeles and San Francisco are listed on page 140.